TIMEHRI

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THE JOURNAL

OF

The Royal Agricultural & Commercial Society

OF

BRITISH GUIANA.

Edited by ... ... J. J. QUELCH, B. Sc., Lond.

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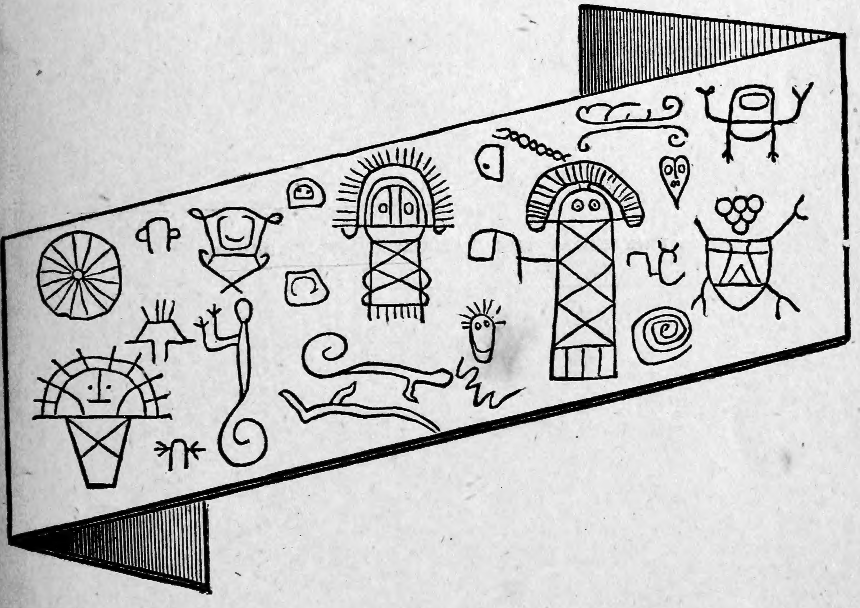

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AS the question of the continuation of the Journal was not settled until the May meeting of the Society, the present issue has been necessarily delayed.

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The list of reporters contains the names of men well known in connection with the subjects of which they write; some of the papers are more complete than others, while on several matters fuller information would have been welcome. More than one paper bears evidence of compression, and the impossibility of doing justice to certain subjects in the few pages allotted, is referred to by some of the writers.

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the excellent series of specimens exhibited by Mr. B. V. ABRAHAM at the Local Exhibition in 1885 were not shewn in London—says, "One small bar of gold denoted "the existence of alluvial diggings on the Cuyuni river, "but the importance of the gold fields must not be "measured by the size of this Exhibit. From personal "observations I can testify to the richness of the aurifer-"ous country on the banks of the Cuyuni in the neigh-"bouring state of Venezuela with its famous Callao and "other mines, and the British territory deserves serious "exploration." The specimen referred to assayed 920 parts out of 1000, and was sold by me for the Exhibitors, Messrs. DOS RAMOS and DACOSTA, to Messrs. ROTHSCHILD, who have shewn some interest in our gold industry, and to whom I have sent information as to our progress, with copies of our Ordinances and Regulations.

Gold occurs in four regions of the Dominion of Canada; among these are 7000 square miles of Nova Scotia, where the metal is chiefly won from small quartz veins 4 to 15 inches wide. The amount extracted from 1859 to 1885 was 395,180 ounces, and in the latter year 22,203 oz. were obtained.

In British Columbia, the gold is principally found as in this colony, in alluvial deposits in the valleys of existing rivers, but the yield is decreasing.

In 1885 the yield was only 670,783 oz., while the quantity produced from 1858 to 1885 was 49,342,558 oz. It is, however, believed that with the facilities rendered by the Canadian Pacific Railway, quartz mining will be commenced and will prove remunerative.

New South Wales, in which colony 103,736 oz. were obtained in 1885, exhibited a good series of specimens of

auriferous quartz and granite, amongst them a water-worn lump of quartz containing veins of gold, said to be the first nugget found in Australia. There were also some cubes 2 inches on the side, of auriferous iron pyrites. Another ore contained as much as 3 to 6½ oz. of gold per ton. It will be remembered that pyrites has been often mistaken for gold, and that "Master MARTIN FROBISHER" in 1577 when searching for the north-west passage, laded his ships with this ore, with which he returned to England only, to find, as he states, the old proverb verified, "all is not gold that glistereth."

Victoria exhibited as the first gold discovered in that colony, a small lump of iron-stained quartz not bigger than a hen's egg, showing one speck of gold in a small cavity $\frac{1}{16}$ of an inch in diameter. Gold is found in Victoria in veins or reefs and alluvium. One company started in July 1865, with a capital of £12,000, began crushing in November 1868, and has since won 452,794 oz. of 20 carat gold or 1 oz. 11 dwt. 22 grains per ton. This gold was worth £1,596,645, of which 60 per cent has been paid to the lucky shareholders.

Victoria shewed an arch apparently of gold bricks weighing 1,000 oz. each, representing in bulk the amount raised in the colony to the end of 1885, viz. gold to the value of £216,000,000 or $1,036,800,000. It is unnecessary to say that gold mining is prosecuted with skill and energy. The Government spends thousands of pounds a year in prospecting with diamond pointed drills, and cores of from 1 to 3¼ inches diameter were shewn in the Victorian Court. In 1885, 735,218 ounces of gold were raised in the colony. May we indulge in the hope that British Guiana will some day

in the near future, rival in this respect her sister colony in the South?

In South Australia, the precious ore exists, but mining enterprize does not appear to be very active. In 1885 only 4,692 oz. were won.

Queensland on the other hand is producing more gold than any other colony except Victoria. In 1885, 310,941 ounces were produced; nearly one-half being won by the Charter Towers and Cape River Gold field. Quartz, more or less mixed with iron pyrites and galena (lead sulphide) &c., is the source whence this metal is obtained. As in the other colonies, some of these ores are shipped to Germany to be reduced. From one place (Mt. Morgan near Rockhampton), there were sent specimens of a remarkable deposit, which, yielding on assay from 3 to 10 ounces of gold to the ton, constitutes a mass 300 feet wide and workable as an open quarry; the metal produced is moreover of extreme purity containing 99·7 of gold. The Queensland Quartz Crushing mill with its red-shirted gold-miner was one of the sights of the Exhibition, and daily attracted crowds of interested visitors.

West Australia showed one nugget of 28 oz. 6 dwts. Alluvial deposits are the sole source of gold in this colony, but there is no doubt of the existence of auriferous quartz, and of the near approach of an era of prosperity for this colony.

In New Zealand, gold occurs in three kinds of deposits; quartz veins, alluvial deposits, and recent sea beaches.

In this Court was exhibited a lump of quartz weighing 105 lbs., the gold in which was valued at £140. The Cam-

bria mine, the paid up capital of which in 1884 was but £1,837 10; by the beginning of December 1885 declared dividends amounting to £48,825. Another mine, bought 4 years ago for £250, has, with a capital (including purchase money) of £946, won 41,473 ounces of bar gold, worth £114,136, yielding to the shareholders £60,750 in dividends.

The New Zealand gold-bearing alluvia are spread over the country in beds often several hundred feet thick, but gold is also obtained by dredging sand and gravel from the bottom of existing rivers. The dredgers are worked by steam or by paddle-wheels driven by the force of the current. We in British Guiana might take a hint and ascertain whether the deposits in our river beds are auriferous; if so, our tidal streams would, as in New Zealand, afford motive power for dredgers.

Recent sea beaches in New Zealand, formed or added to by auriferous sand carried down by the rivers, are also worked, yielding $1\frac{3}{4}$ oz. to the ton as gathered, and 4 oz. 4 dwts. when concentrated.

The Transvaal also produces gold in its eastern parts. The quartz reefs near Barberton vary in thickness from 4 or 5 inches to 2 feet 6 inches, and produce 1 to 5 ounces per ton; 2,875 tons of this quartz yielded 5,369 ounces of gold or 1 oz. 17 dwts. to the ton. In 1885, 52,228 ounces were exported through Natal alone.

Mr. FOSTER in summing up remarks that the gold-producing capabilities of Australia, New Zealand and Canada are very great; that although the shallow, alluvial diggings of Australia, which could be worked without capital, are exhausted in some places, "deep leads" and quartz reef abound, only waiting for capital to develop

them. He also remarks, and we may take comfort therefrom, that the history of gold mining proves that enormous sums are not required for the development and successful working of mineral properties.

MEAT AND DAIRY PRODUCTS AND GRAIN are the subjects next dealt with, but British Guiana and the West Indies find no place in these sections.

FRUITS are reported upon by Mr. D. MORRIS formerly of Jamaica, now assistant-director at Kew, who takes the greatest interest in the fruit of this and our neighbouring colonies. Mr. MORRIS recently read a most interesting paper on the subject at the Royal Colonial Institute, and in a lecture given at the Exhibition last year, illustrated his remarks on the fruit of this colony, by the papier-mâché and wax models exhibited in the British Guiana Court, and by specimens of fresh fruit of various descriptions imported from here.

In the report before me, Mr. MORRIS states that "it "is now clearly demonstrated that by careful and "judicious treatment and storage in a cool chamber, "numerous tropical fruits from the West Indies can be "brought to England in a perfectly sound condition. "Bananas arrived from British Guiana, while such perish-"able fruits as papaw, sapodilla, mango, avocado pear "were received from the West Indies (and from this colo-"ny) in excellent condition. In the rich, alluvial soils of "British Guiana all tropical fruits are capable of being "cultivated, and the dried and preserved articles shewn "in the British Guiana Court, no less than the models of "fruits produced in the colony, indicate that a large and "undeveloped field of industry is connected with them."

As one of the Executive Commissioners, I have already

reported to the Royal Agricultural & Commercial Society on the ready sale of our bananas in the exhibition market, over £13 worth having been sold in penny-worths in one day; other fruit as sapodilloes, semitoes &c., were in excellent order and were evidently an agreeable novelty. Souarrie nuts were also readily purchased, and from my own observation I am convinced that many, if not all the fruits which are or can be produced in British Guiana, would find a quick and profitable sale in England, where there is so large a demand at certain seasons. Of oranges and lemons or limes, for instance, there were imported into the United Kingdom in one year (1885) upwards of seven million dollars worth, of which only thirty thousand dollars worth came from British Possessions; indeed of the £7,587,523 worth of all kinds of fruit imported that year, only £302,399 worth came from our colonies. With so enormous a demand for fruits, many of which are so easily grown here, it seems almost a culpable neglect of opportunities not to direct our attention to the cultivation and export of products with which nature has so bountifully provided us. Pines which will keep without special storage for 12 days, besides being shipped from the Bahamas in large numbers in a green state (455,965 dozen, worth over £50,000 having been exported thence in 1885), are also largely exported in syrup. Singapore, however, has established itself as the best source of preserved pines in the London Market.

The small island of Montserrat, the area of which is but 47 square miles, with a population of 10,000, is the head quarters of the lime industry in the West Indies, and in 1884 exported £10,300 worth of lime-juice. To Tobago belongs the credit of having in quantity and general

representative character, the most complete exhibit of preserved fruits, 200 in number, of any in the tropical section.

Mr. MORRIS in his interesting report, says much that should cause attention to be directed to the development of an industry followed profitably in Jamaica and elsewhere, for which this colony with its abundant and fertile lands, easy communication with the United Kingdom and with America, is especially suitable.

The Fruit industry, moreover, whether confined to raising and shipping bananas, oranges, pines &c., or extended to the preserving and canning fruit and the manufacture of jellies, syrups &c., would afford employment to a large class who now find it difficult to obtain the means of existence.

The Reports on COFFEE and COCOA were intrusted to Mr. HENRY PASTEUR, who, it will be recollected, was good enough to make the special report on the specimens of these products shewn by British Guiana, which was communicated to the Royal Agricultural and Commercial Society last year.

Mr. PASTEUR reports that India is first and foremost amongst British Possessions both for the quantity and quality of its production of coffee, in spite of the ravages of the leaf disease. He strongly advocates the shipment of Coffee in parchment, to be peeled and sized in London, and gives instances of Coffee from Costa Rica thus treated, realising from 10/ to 14/ per cwt. more than that cured in the ordinary way. The parchment not only preserves the colour and quality of the berry against damage, but allows the berry to mature more completely.

There were specimens of Coffee shewn by Jamaica,

the only island of the West Indies where cultivation is carried out on a large scale. This island, which in 1885 exported 80,600 cwt., possesses in the high lands of the Blue Mountains, one of the finest coffee growing districts in the world.

Mr. PASTEUR evidently has an unfavourable opinion of Liberian coffee which has been to some extent tried in this colony. He says its quality is so poor, so deficient in strength and aroma, and so little appreciated in the home markets, that any material increase in supply must inevitably tend to a lower range of prices, which will fail to repay the outlay. The value set on the specimens shewn ranged from 140s. to 47s. per cwt. The Liberian was worth 50s.

Nearly all the other West Indian colonies sent exhibits of coffee, which in the case of most of them was an important article of export in byegone years, but is now scarcely cultivated. Dominica, which at one time produced one of the best kinds in the market, suffered from an insect blight forty years ago, and now raises not more than equals the consumption in the island.

Trinidad, Mr. PASTEUR considers well fitted for the growth of coffee,—the shape and size of the berries showing that soil and climate are favourable, and that only labour, care and skill are required to give the coffee its proper value.

The Reporter is of opinion that the samples from British Guiana tend to prove that excellent coffee can be grown in this colony. These specimens were affected by sugar, and if this product ever assumes its place as an article of export, it will be necessary to avoid its being so injured, either by shipping the bean in its parchment

envelope, or by selecting vessels in which care is taken to prevent contact between coffee and other cargo.

British grown coffee is superior to that of other countries for reasons which Mr. PASTEUR mentions. The increasing demand, and the diminished supply from Ceylon and elsewhere, should encourage the renewal of a cultivation, which, once a source of wealth to the older, colonists of British Guiana, now exists only in small and scattered patches.

COCOA was exhibited by the West Indies, British Guiana, Ceylon and Mauritius. The world's production of this article is estimated at 100 to 120 million pounds, of which 25 millions are raised in English colonies. Its consumption is on the increase in Great Britain, and in 1885 amounted to 14,500,000 lbs. Ecuador supplies the largest quantity, and its crop influences the market.

With regard to Trinidad Cocoa, although it is not considered equal to that from Caraccas, which is the finest produced, the quality of the seed, and attention paid to its growth and preparation result in the attainment of great perfection. The samples shewed large size, weight, and solidity of the kernel of the cocoa, with fermentation carried to the point at which the fullest amount of strength and flavour can be obtained.

Grenada which produces 5 to 6 million pounds yearly, sent a few specimens which do not appear to have been of first class character, so that it was scarcely represented in the Grenada Court. The cocoa is inferior to that of Trinidad, being smaller, and coarser in flavour. It is, however, used in the British Navy along with Trinidad cocoa to the exclusion of other kinds. The exhibits from Dominica, St. Lucia and Jamaica, were of average

quality, but had suffered from want of care in curing; the last named colony, it would appear, has been unfortunate in the quality of seed used, which has resulted in the inferiority of the chocolate trees.

Mr. PASTEUR says that the cocoa from British Guiana in quality, flavour, and size, was fully equal to the best from Trinidad, and the excellent character of these samples shews that the soil is eminently suited for the growth of cocoa, and that if the cultivation was taken up in a proper spirit, it would probably add greatly to the wealth of the colony.

It is interesting to note that Ceylon cocoa appears to have undergone a considerable change in becoming acclimatised. It has a fine flavour,—without, however, the desired strength,—and it does not stand the system of fermenting and drying without washing, as adopted in Trinidad. Whether this results from inexperience or from difference of climate or soil, Mr. PASTEUR says must be decided by further experiment. It is doubtful, he adds, whether there is enough land in Ceylon combining the requisites for a good cocoa plantation, viz., fine, deep, rich soil, sufficiently moist, a good rainfall, and shelter from the wind, to justify the expectation that the culture will be extended much beyond what it is at present.

Mr. NEVILLE LUBBOCK assisted by Mr. W. E. HALSE and Mr. JOHN McCARTHY of Trinidad, sent in a report on SUGAR which has already appeared in print, and been well circulated. The subject is one of such importance to this colony, that it is to be regretted Mr. LUBBOCK had not more than half-a-dozen pages at his command. He states that about five million tons of sugar are yearly

produced, but this does not include that raised and consumed in India, China, and other countries. The cane and beet produce 2,500,000 tons each. This quantity of cane sugar with the exception of 200,000 tons, is produced without subsidy or assistance from Government, while not a pound of beet sugar is raised without such artificial aid.

The largest consumers of sugar, as far as can be ascertained, are the United States of America and the United Kingdom, 1,200,000 tons being consumed by the former, and 100,000 tons more by the latter.

The sugar produced by British possessions, including 50,000 tons exported from India, is 500,000 tons.

Mr. LUBBOCK is of opinion that the Indian samples were of a high class, but unsuited to the English market, being wanting in brilliancy, and inferior in appearance to the loaf. It will be remembered, however, that Mr. HOWELL JONES considered some samples from the N.W. Provinces of India the finest in the whole Exhibition.

The Australian Colonies were represented by New South Wales and Queensland which produced 17,500 tons and 55,900 tons respectively. Fiji and Mauritius whose production is estimated at 12,000 and 120,000 tons, supply a large quantity to Australia.

The few lines in which the sugars of the West Indies and British Guiana are treated, tell us that these are all eminently suitable for the English market, except the white crystals, which are wanting in a sparkling appearance produced by the home refiners at a trifling cost, but not attainable by those working on a smaller scale, except at an unremunerative outlay.

Mr. BANNISTER'S report on WINES, SPIRITS, BEER and other fermented liquors, is comparatively lengthy—much space being devoted to colonial wines which attracted a good deal of notice during the Exhibition. Of these, as of beer, we in British Guiana are consumers, not producers; but we learn that in New South Wales an acre of vines, the cost of cultivation of which varies from £6 to £10, produces from 250 to 600 gallons, the lowest price being 4/ a gallon for new wine, which apparently gives a large profit. It is to be regretted that there are difficulties in the way of making wine in the tropics where grapes grow so readily. An experiment made many years ago in St. Vincent, where German immigrants were obtained for the purpose, utterly failed.

Of the spirits exhibited, those derived from the sugar cane, were the most numerous. The West Indies and Guiana are reported to have had very varied and excellent collections of rum and other spirits used as beverages or medicines. Mr. BANNISTER remarks that why Jamaica rum should differ in quality and character from that made from the same material in adjoining islands, is a problem not yet solved. One reason mentioned in the report is that the Jamaica distiller, by using in fermenting and distilling operations, a portion of the lees obtained from previous operations, secures for his rum a special character which develops by keeping. Distillers are accused of extravagance, resulting in a loss of 40 per cent. of the sugar used, in permitting the diluted molasses &c., to ferment spontaneously instead of assisting the operation by means of yeast.

No comparison of the products of the several colonies contributing, appears to have been made;

there being perhaps no striking points of difference. The West Indies, as well as British Guiana, exhibited spirituous compounds, partly beverages and partly medicines, most of which, Mr. BANNISTER states, contain extract of Cinchona bark, and amongst these are included Angostura bitters; but the principal medicinal ingredient in these, according to Mr. HOLMES, is not Cinchona nor quinine, but a tonic which, hitherto attributed to *Mikania amara,* undoubtedly belongs to plants of the genus *Aristolochia.*

The export of SIEGERT'S bitters from Trinidad is 600,000 bottles per annum. By some it is thought that this preparation has not of late equalled what was made by Dr. SIEGERT at Bolivar, from whence he removed to Trinidad; be this as it may, the bitters of this maker exhibited at our Local Exhibition in 1885 were thought inferior to that of a local manufacturer (Mr. T. MATTHEWS). One other preparation of bitters from British Guiana exhibited last year, was so impudent an imitation of Messrs. SIEGERT'S, in bottle and label, that their agents required it to be withdrawn from exhibition.

Mr. BANNISTER alludes to the extensive manufacture of what he terms "hybrid mixtures" in the French colonies; and as these mixtures can be prepared with most primitive apparatus, and in any locality, the manufacture of them gives employment and a respectable living to many who otherwise would not be able to obtain a livelihood.

The materials for making liqueurs, such as orange, limes, cacao, coffee, noyeau, &c. are plentiful in this colony, and there is no reason why we should be dependent on other countries and colonies for our supply. The in-

troduction of home-made liqueurs would not only be beneficial to those who are now prevented by the high price of the imported article from consuming them, but would also create a new industry. Difficulties arising from our system of excise might be obviated without doing away with the precaution necessary for the protection of the revenue.

The report on TOBACCO has been contributed by Dr. WATT, C.M.G., whose knowledge of East Indian products and manufactures is most extensive, and by Mr. MCCARTHY of Trinidad, to whom, not only that island, but the West Indies generally, were indebted for valuable services at the Colonial and Indian Exhibition. This paper is interesting, giving as it does a history of tobacco, with an account of the various modes in which it is used by different nations and races.

Of the fifty species of *Nicotiana* known, only two, or at most four, are cultivated for the leaf. The most extensively cultivated is *Nicotiana Tabacum*, recognized by its long, pinkish flowers, and tapering oval-lanceolate leaves, a native of America, extending from Mexico to Bolivia. This is the species which grows in this colony. It is hardy and self-sown, which is rarely the case with the other kind, *N. rustica*, the leaves of which are coarser and more crumpled than those of *N. tabacum*. There are three other varieties, one said to yield the finer qualities of Cuban tobacco, and the others yielding Persian, and the strong tobacco of Chili.

Tobacco requires a rich or freely manured soil, the ash containing 16 to 17 per cent. of inorganic constituents. It is practically immaterial what seed is used, it is the chemistry of the soil that can alone ensure good tobacco.

Sugar, liquorice, or alcohol, are used in the manufacture of tobacco for the purpose of getting rid of certain organic materials, the combustion of which would yield an objectionable flavour, and in some parts of India the pulp of the *Cassia fistula,* which is not uncommon in this colony, is used for the purpose.

Dr. WATT considers climate to be a most important condition affecting the quality of tobacco, which has not hitherto been found apart from tropical and semi-tropical countries. The West Indies have always been famous for producing a tobacco richer in aromatic principle than that grown in most other countries, and this is due to their warm and moist climate. All attempts at producing a leaf of the peculiar quality of the Havana variety, have hitherto failed elsewhere than in the West Indies.

The advantages which these colonies possess in being the owners of a good raw material, are dealt with by Dr. WATT, who holds out much encouragement for this industry. He says that it is hardly creditable to Britons over the sea, that they should be so largely dependent on Manila and Singapore for supplies of cigar wrappers, and that the best cigars in Britain should be of foreign origin.

Jamaica, however, has done much to rival Cuba in this respect, and Trinidad cigars, which Dr. WATT says were made of tobacco as good in quality as that of Havana, were largely patronized at the Colonial Exhibition. It may be a reproach to us in British Guiana, where pipe tobacco to the extent of £16,000 sterling yearly, is imported, to be dependent on the United States for an article, the raw material of which grows here like a weed. It is true that

pipe tobacco is in every case the product of a milder climate than that from which cigar sorts are procured, but possibly some change in the mode of manufacture would lessen any difference which might be found to exist between the native and imported kinds.

The tobacco sent from this colony was not designed for market, but was exhibited more as a specimen of what was produced and used by the Indians of the country. It is gratifying to find that, nevertheless, it was reported to be of good quality and carefully cured. Its compressed state rendered it unfit for the British market.

Dr. WATT concludes with a "general note" of some value. He says that when seed is imported, a mongrel crop is produced, in the first season, partly flavoured with the soil. In the second year the crop is truer to the seed. Leaves keep in better preservation when ripe. They should not be green nor dead, nor should they be left open, but pressed to preserve the flavour. Stalks should never be sent with tobacco.

Dr. PAUL'S report on DRUGS, CHEMICALS, AND PHARMACEUTICAL PRODUCTS deals with cinchona, which was introduced into Jamaica as an experiment by Government in 1866, and is now cultivated to the extent of 150 acres. Ceylon is the chief source of this valuable bark, from which quinine is extracted, and in each of the years 1884 and 1885, exported 11,000,000 lbs. Bebeerine at one time was proposed as a cheaper substitute, and greenheart bark from which it is obtained, attained some value; but quinine is now produced at a price which prevents the necessity of employing any substitute.

Some of our Guiana Exhibits, such as quassia, copaiba,

honey, castor-oil, lime-juice and cane-juice vinegar, are merely mentioned, and are lumped together with similar products from other colonies. Our large number of astringent barks used for medicinal and tanning purposes, are dismissed in a few lines, and one must have recourse to the more complete and careful notice of these products of Guiana afforded by the pamphlet of Mr. HOLMES of the Pharmaceutical Society.

PERFUMERY is noticed by Dr. PAUL, who reminds his readers that there are numerous raw materials in the West Indian colonies that might be turned to useful account for the manufacture of perfumes. In this connection, mention may be made of numerous essential oils available for perfumery purposes. Plants yielding fragrant oils are abundant, and there is a large field for their industrial application. A flower farm and perfume factory are being attempted in Jamaica, and there are other places, among them British Guiana, where this industry could be carried out.

There were no specimens of OILS and FATS from marine or land animals exhibited by British Guiana. Mr. LEOPOLD FIELD, the reporter in this section, mentions that fish and whale oil have fallen into disuse as lubricants, being replaced by American, Scotch, and Russian hydro-carbon oils, just as kerosene and petroleum have supplanted sperm and colza as illuminants. British Guiana produces nothing in this way, and but three exhibits from the West Indies are mentioned. These were a fine specimen of porpoise oil well fitted to make soft soap, and some shark's oil and a small quantity of whale oil. Nut, seed and fruit oils, with the exception of cocoanut oil, are not produced in this

colony. Cocoanut oil is used chiefly in England for soap and night lights. In the manufacture of candles it has been superseded by acidified palm oil. It gives a white and brilliant light, and articles made from it are more cleanly and tempting than those made from other materials.

Cocoanut oil is largely used in soap making, but considerable prejudice exists against it on account of its rank and persistent odour. Its chief value appears to arise from the facility with which it can be adulterated. One of the tricks of the soap trade, it seems, is to crowd in silicate and carbonate of soda, sugar and water, and to hide any objectionable smell with mirbane and lemon-grass.

The British Guiana cocoanut oil is described as very good and remarkably white, though slightly rancid and strong smelling. These, Mr. FIELD says, are "accidents of circumstance", and he is of opinion that there is no reason why Guiana should not vie with other colonies as an oil-producing country.

The question is raised whether the kind of nut, and the method of cultivation may not have as much to do with the colour and odour of the oil as the mode of extraction, or perhaps more. This, it seems is the case with palm oil. Mr. FIELD mentions as an instance of the effect which difference of soil will make in the quality of oil, the case of lavender. English oil of lavender produced at Mitcham, in Surrey, commands more than six times the price of that from all the south of France. The same, he says, is true of rosemary and peppermint, and he suggests that the point whether a different cocoanut or a different soil be required, is worth attention.

There is one nut, the Candle-nut, *Aleurites triloba*, which, produced in Fiji, Ceylon and elsewhere, yields 55 to 62 per cent. of its weight in oil. This tree has been introduced into some of the West Indian Islands, and doubtless would grow well here.

Castor-oil is good as a lubricant for heavy machinery, but will in time yield to petroleum and shale oils. It has a peculiar and unique property, (besides its aperient qualities), of being perfectly soluble in alcohol at ordinary temperatures, which causes it to be largely used in the manufacture of Brilliantine and other hair dressings. For soap making it has a special value, and is indispensable in the manufacture of cheap transparent soaps. Mr. FIELD, who, by the way, is a maker of soaps on a large scale, and, moreover, one of our best practical chemists, while admitting that these soaps cannot be recommended, as an excess of caustic soda is required, and that the smell of the castor-oil becomes apparent in a few weeks, says their brilliant lustre and scouring properties possess great attractions for natives. Perhaps it was some such preparation that made the bishop of Wangaloo white, as is represented in certain illustrated advertisements.

Mr. FIELD goes on to say that it is a matter of surprise that with cocoanuts and castor-oil seeds to be had almost for the picking, these soaps are not made in Ceylon and the West Indies, where spirit is easily and cheaply obtained, where sugar (an important adulterant) is plentiful, and where, above all, essential oils abound. We know that in Trinidad there is a soap manufactory, but the qualities shewn were "poor, com-"posed of 'weak fats' and 'much resin'—of a dark "colour and alkaline, and indicating a large excess of

"water in their original composition." These faults are of course avoidable.

One oil was exhibited in the Jamaica Court which is highly extolled by Mr. FIELD. I refer to it, as the tree whence it is produced grows here easily, and is by no means uncommon. We know it as the horse-radish or seringah, but its botanical name is *Moringa pterygosperma*. Its seeds yield oil of Ben or Behen, described as an exquisite oil, and one which, though apparently devised by nature expressly for the perfumer, seems to have been singularly neglected. Mr. PIESSE, in his "Art of Perfumery," is enthusiastic in its praise. It would be invaluable to the flower farmer, who by the process known as enfleurage, *i.e.,* submitting blossoms to the action of oils or lard, extracts their perfume. It is also said to be the basis of macassar oil which is, or was, so fashionable.

Referring to 'enfleurage, the Jamaica Court shewed fine specimens of tuberose and jasmine pomades. Surely British Guiana could do likewise with behen oil. These and other pomades and oils, for which the demand in England alone is enormous, could be manufactured here, and a profitable industry created. Mr. FIELD'S remarks on this subject are worth laying to heart. "Why," he asks, "should not our own colonies supply us? Why "should all our citron, bergamot and orange oils come "from Messina and Spain, when the West Indies can "grow these fruits in any quantity?"

Carapa or Crab oil, it appears, would be a fine and valuable oil but for its sickly and persistent odour. It proved impossible to get rid of this defect—blowing hot air through a pint of it for 24 hours was ineffectual. It

is, however, easily saponified,* and the smell becomes similar to that of fresh cider. It has, on analysis, been found to contain a bitter principle named Carapin, to which no doubt its insecticide properties are due. The association of its being used for this purpose might militate against its coming into general use, otherwise an acceptable pomade could be made from it by means of dexterous perfuming.

A considerable portion of Mr. BOLAS'S report on GUMS, RESINS, &c., is devoted to the balata, or, as the writer prefers to call it, the gutta-percha of the Bullet-tree, and gum animi,—both products of this colony. His remarks have been already published in the *Argosy*, and it would be most interesting if his Cantor Lecture, delivered in 1880, on Indian rubbers, were also communicated to the public of this colony, which possesses one or more of the most valuable gums known. Mr. BOLAS evidently appreciates our Balata. He believes it is of greater use and value than the average crude guttta-percha from other sources. I do not know how far he is justified in paying the people of the balata districts of this colony, the compliment of attributing this superiority to their higher moral character. Mr. BOLAS believes that high moral character in the workman ensures corresponding care to deal intelligently and honestly with the material, as well as abstention from adulteration; and so far he is no doubt theoretically right. Whether facts bear out his hypothesis in the case of the balata collectors of

* A specimen of Crab-oil Soap, prepared by Messrs. Field and presented by Mr. Hawtayne, is exhibited in the British Guiana Museum. —ED.

this colony is, however, questionable. Mr. JENMAN'S favourable report on the social condition of the people of the Baracarra district, has so impressed Mr. BOLAS that he claims it as supporting his view. Be this as it may, balata is evidently a product to be prized, and, what is more, to be jealously guarded against exhaustion by indiscriminate and injudicious treatment of the trees which yield it.

There has been on this subject, as on others, a certain amount of legislation. I think British Guiana may well rank as one of the largest law-producing countries of the world. In it, to the making of laws there is no end; but when one takes up the Statute book and sees how few of a certain class of Ordinances, are enforced, one is inclined to ask whether less theory and more practice is not desirable.

It may be also a question whether, not only as regards the preservation and proper collection of our natural products, but also the introduction, cultivation and preparation of others, it may not be wise to create a department of Economic Products, by means of which the Government may employ a portion of the revenue in fostering certain industries, which, in all probability, would be the means of increasing both private and public prosperity. Much of our natural wealth requires to be protected and developed. The colony is fit and able to receive and adopt other products of great value. To depend on the spasmodic and short-lived efforts of individuals appears fruitless, while valuable results may flow from well directed enterprise.

Mr. BOLAS says that the capabilities of supply of "gutta" in British Guiana seem to be enormous, and

that if the misleading term "balata" were dropped, and relations opened directly with the manufacturer, a very large trade could be done in this article. Balata, or gutta, suffers from coming into the market as a different material from gutta, and under another and less recognised name. It has been bought by speculating dealers at a nominal price as bullet-tree gum, and sold to the manufacturer at the market price of the best gutta. It is also desirable to adopt some system of coagulation of the fluid gum which would advance the quality of the product, or minimise deterioration by oxidation. It appears that ozone, which, to a certain degree, is beneficial to human life, is the cause of rapid decay in gutta and rubber—a thin leaf of the former falling to dust in strongly ozonized oxygen. It is recommended, therefore, to mould the product into thick compact masses rather than into thin sheets.

The India-rubber shewn in the British Guiana Court was considered sound and of good quality. Mr. BOLAS believes that much of it was obtained from the Touckpong tree, which is a variety of *Sapium biglandulosum*. Another sample shewn was from *Hancornia speciosa*. The rubber from *Hevea Spruceana* was submitted by Mr. HOLMES to well-known brokers, who stated that it had never come into the London market, and that if well cured, it would command 2/ to 2/2 per lb. The sample of Hancornia or Mangeibera rubber was cleaner than the samples usually sent to the London market, and was valued at 1/10 to 2/ per lb.

The samples of Gum Animi, or Locust gum, were considered exceptionally fine. Mr. BOLAS remarks that the value of this material is quite understood by varnish

makers. Mr. HOLMES of the Pharmaceutical Society found that it was readily soluble in Eucalyptus oil and formed an excellent varnish. In the solid state it is capable of being worked up into an imitation of amber, and, mixed with that substance, becomes an admirable material for mouth-pieces of pipes, &c.

Dr. SCHUCHARDT of Goerlitz informs me that he is engaged in chemical examination of our gums &c., and promises to communicate the results. Professor WALLACK is also investigating their composition.

Karamanni also attracted the attention which it deserved. Mr. BOLAS thinks it worthy of investigation. It is, according to Mr. IM THURN, a compound of resin from a *Hevea*, bees-wax and powdered charcoal. A "wax gutta," something like the Karamanni, was shewn by an exhibitor in the Sierra Leone Section.

COTTON, once one of the staple products of this colony, was but poorly represented at the Exhibition, as far as British Guiana was concerned. One of the samples shewn was, in the opinion of Mr. BUTTERWORTH (from whose report I quote), a Brazilian variety, retaining the features of that class of cotton in its harshness,—but well grown and of good staple. Another sample was evidently grown from Sea Island seed, and, if freer from leaf and dirt, would have been almost of a pure white. It had, however, one serious defect in irregularity in the length of staple, which is objected to by spinners, as it is difficult to manipulate.

Although Mr. BUTTERWORTH reports that our colony has extensive tracts of land "adapted for "cotton growing, which, with the improved methods "of cultivation, selection of seed and ginning, would

"produce an article in bulk and quality that would "be hard to beat," he is but speaking of a defunct industry which it appears impossible to revive. Cotton has died out also in the Islands, except in some of the Grenadines—small islands between Grenada and St. Vincent, where its cultivation, along with that of corn, affords subsistence to a sparse population, and where the remains of well built mansions, and other vestiges of an opulent proprietary testify to the prosperity which existed when "Cotton was King." It is interesting to learn from Mr. BUTTERWORTH'S report that a hundred years ago, the Society of Arts of London granted a gold medal to a planter of Tobago for the best sample of West Indian cotton, and that the sample shewn in the Exhibition last year from that Island was of "an excellent colour, and capable of "spinning into number 60s, and in grade equal to good "Orleans—shewing the growing capabilities of the colony "to be maintained."

SILK, which formed a wonderfully interesting exhibit in the Indian Court, is reported on by Mr. WARDLE, who is enthusiastic in his belief in this product as a source of wealth to many parts of Her Majesty's Empire. His work on the Silks of India is a most interesting book. Some Cocoons of a moth which is tolerably common here, have been sent by me to Mr. WARDLE for examination and report, and there are some specimens of Attacus-moth under observation at the Museum. I understand that an attempt at sericulture was commenced by the late Mr. OLIVER, which however did not go beyond raising mulberry trees as food. There are so many indigenous, or easily cultivable,

sources of food for silk-worms other than *Bombyx mori*, that it might be far from difficult to establish silk-worm culture here.

There is probably no minor product of British Guiana from which greater results have been expected than from FIBRES. There are so many fibre plants growing wild in this colony, samples of which it costs little to collect, and apparently possessing useful and valuable qualities, that people are often tempted to turn to these as a more than probable source of profit. Reports and quotations based on samples sent to London or elsewhere, often raise hopes and stimulate efforts, but hitherto there have been no satisfactory results. Nor is this confined to the products of British Guiana. Mr. CROSS, the reporter on Miscellaneous Fibres, says this department of industry has been, perhaps, exceptionally fruitful of baseless enterprise—of abortive attempts to make into commercial undertakings that which careful antecedent investigation would have consigned to the long list of the unprofitable. The question also arises :—Is there any necessity for an extended application of the multitudinous vegetable fibres ? Are not those fibres now in possession, sufficient, not only in supply but in kind, *i.e.*, in variety, for all the possible purposes of vegetable textiles ? Supposing the supply insufficient, are we not rather to seek the remedy in improved methods of producing and treating our present raw materials, than in introducing new ones ? Especially since a new fibre means new methods and machinery for agriculturists and spinners.

It would take too much space to transcribe Mr. CROSS'S highly interesting remarks on the structure and properties of various kinds of fibre. They are grouped as

materials for industry according to their application, and these groupings, it seems, follow their classification based on origin, structure, and chemical composition. Cotton, which consists of independent ultimate cells, differs from raw materials which are "fibre-aggregates", or bundles of ultimate fibres bound together by contact or adhesion of the cell-walls, or cemented by a third substance. In the cases of straw and Esparto grass, the whole plant is regarded as a fibrous raw material.

A certain unit of length is required in spinning processes, and the value of a raw material depends on the length, fineness, or divisibility of the fibre bundles of which it is composed. Strength and durability are also qualities which determine its value, and these depend upon the ultimate structure and chemical composition—ascertained by laboratory investigation.

That portion of raw fibre material which resists the ordinary agents and alkaline solvents used in bleaching, is the cellular basis of the material, consisting of ultimate fibres or fibre cells, which vary in length according to the plant source from which they are derived. The lengths of these individual cells with their proportion in weight to the raw fibre, are taken as tests of value—"Constants," as they are technically termed.

Flax, hemp, rhea and jute, which are the fibres of dicotyledonous plants, possess a percentage of cellulose varying only from 75 to 80 degrees, while the length of ultimate fibre, which in flax is set down at 25-40 mm. and in jute at 3m. rises to 60-200 mm. in rhea; and in monocotyledonous plants, furnishing a large proportion of rope-material such as manilla *(Musa)* or plantain, New Zealand flax *(Phormium)* and Agave, cellulose is from

63 to 76 per cent. and the length of fibre from 2-8 mm. to 8-15 mm.

There are other fibres than the above which are used in *textile* manufacture, but these are unavailable for that purpose, and require to be broken up by chemical action in order to serve the purposes of the paper-maker. Bamboo, straw and Esparto are entire stems or leaves of monocotyledonous plants, and are treated by boiling at high temperatures, for separation of fibrous portions, by washing and by bleaching. Mr. CROSS refers, for details of the various chemical methods employed, to a paper in the Chemical Society's Journal for 1883. Much information is also to be found in Mr. CHRISTY'S "New Commercial plants and drugs" No. vi. "SPON'S Encyclopædia of the Industrial Arts 1881," but the report made by Mr. CROSS to the Indian Government will, when accessible, be of the greatest value to this and other colonies.

The real value of the fibres of the West Indies, (with which Mr. CROSS includes those of Guiana), will be more appreciated when this work is published. No fibre exhibited by British Guiana appears to have presented any qualities greatly superior to those possessed by other and better known products. Megass from the sugar-cane has been considered worthy of attention as a paper material, and some machinery was erected in this colony for its conversion into "half stuff," but Mr. CROSS declares it to be inferior to that yielded by bamboo, and not to be recommended to paper-makers. He doubts whether by any process it could be converted into a useful paper-making material at a reasonable cost.

Banana fibres are of fair length, and have been proved to

possess good paper-making properties. Mr. CROSS obtained by treating the raw material, 31 per cent. of a well bleached, clean, tough fibre. So low a yield however is to be regarded as prohibitory, a yield of 50 to 60 per cent. being necessary before a fair price could be realized in Europe. Paper from Banana was shewn to the members of the R. A. & C. Society and this, among other qualities, could be written on without being sized.

The fibre of the silk-cotton *(Eriodendron infractuosum)* was exhibited from several colonies besides British Guiana, and some remarks, on it have been already laid before the Royal Agricultural and Commercial Society. It differs in structure from true cotton; the latter is always somewhat flattened, and possesses a natural twist peculiar to itself, while silk-cotton fibres are straight cylindrical tubes. Silk-cotton has a peculiar absorbent quality, which may adapt it for surgical dresings. At present, its chief use appears to be for bedding, for which purpose it is well adapted.

The basts from this colony, of which two typical specimens, Enouroo and Kokoyoko, were analysed by Mr. CROSS, gave results shewing them to be valueless.

Rhea grass is more likely to be a profitable subject for cultivation here than any fibre-plants we possess, and a large number of pamphlets about it have been distributed in this colony. In hemp substitutes and "unenumerated fibres," the West Indies now play an inferior part, but Mr. CROSS thinks that a large proportion of this commerce can be wrested by them from those now holding it.

The commercial issue as to the value of a fibre-product entirely depends on the cost of putting down the treated material at the several ports, in a condition which

would ensure its conversion into pulp at no greater loss than 40 per cent, and such a product, Mr. CROSS estimates to be worth £8 per ton.

It must be remembered that the foregoing estimate is based upon a purely laboratory valuation; and though "sida" from the West Indies will compete with jute, and "grugru" is capable of competing with hemp, the cost of production and freight, and extent of regular supply are not taken into consideration. If those latter conditions are favourable with regard to any one fibre, and the analysis shews the assistance of a superiority of quality, there may be prospect of success; but calculations have to be carefully and thoroughly made, before any dependence should be placed upon the introduction of any fibre, at present comparatively unknown.

LEATHER, FURS, HIDES and TANNING materials were not represented in the British Guiana Court, with the exception of some ocelot, baboon, otter, deer and other skins, which, from want of proper preparation, were in bad condition.

I regret that this was the case, because in the Local Exhibition of 1885, we had such excellent specimens from Mr. FRANK of Eliza and Mary, and others, of well prepared leather from goats. So extensively are crocodile and alligator skins used at home, that one would think it worth while to kill and export the skins of the caymans which are so numerous in our trenches. So-called "Porpoise-skin" is, I believe, the produce of the horse, or, at all events, horse-hides are dressed and sold as porpoise-leather. Some years ago, I sent home the skins of porpoises captured during a short cruize "among the Caribbees" and they were converted

into excellent leather. Porpoise-catching might be followed as an adjunct to other fishing, since the oil and the skin are both valuable.

The Tanning barks of British Guiana were passed over in the report now under notice. There are other sources whence much useful information as to the qualities of the several barks grown here, may be obtained. The Chamber of Commerce in London took notice of such materials exhibited from other parts of the world. Some of these, however, are to be found here, or are capable of cultivation, and with encouragement, a fair supply could be raised and exported from this colony.

Mr. LASTELL'S paper on TIMBER is somewhat disappointing as far as this colony is concerned, because, although he visited our Court and closely examined our numerous and varied exhibits, he has offered no opinion as to their suitability to the English market or English requirements. His observations on each specimen are repetitions of those descriptive remarks which when, compiling the catalogue, I borrowed from Mr. MCTURK'S list of specimens in former exhibitions, and of those furnished by Messrs. PARK & CUNNINGHAM. It would have been more satisfactory if one could have gained from the report the opinion of English experts as to the value of our timbers.

Mr. LASTELL says the timber of the colony was well represented, and that there is quite a mine of wealth in our forests. That is so; but our exhibits were sent not merely to attract attention to the quantity and variety of our timber products, but to elicit from home consumers some opinions founded on their experience and their requirements.

It is true that Messrs. RANSOME invited the Commissioners to send specimens of prescribed sizes, which were longer than British Guiana could supply, for the purpose of their being worked up by the machinery of these gentlemen. The invitation, I confess, appeared to be issued more in the interests of the manufacturers of wood-cutting tools than in those of timber exporters, and I do not think British Guiana lost much by not having put in an appearance.

In conclusion, I trust that these extracts may prove interesting and of some value. All that I can claim to have done is to have picked out from the Reports, what I considered of value to the readers of *Timehri*.

I think that from these reports one may learn much of what is wanted by consumers in England, and (which may be of equal value)—what is *not* wanted. It is better to discourage undertakings which, however promising and attractive to an enterprising colonist desirous of tapping new sources of profit, nevertheless belong "to the long list of the unprofitable." It is well to know what is wanted, and then to see how this colony can supply that want easily, and cheaply. All this requires study, and knowledge of markets, and acquaintance with technical modes of analysis and valuation. These are not always possessed by the producer or collector: often are they ignored by the commercialist on the other side, who is only anxious to secure a new customer, and to speculate with some new product. It is depressing, no doubt, to feel difficulty in developing the resources of one's land: it is, however, more discouraging to see time, energy and capital all thrown away upon some unsuitable, or comparatively useless product for want of previous enquiry.

The Society of which *Timehri* is the Journal, can, it is true, aid greatly in supplying this necessary information; but it may be suggested that our Colonial Government could more easily institute enquiries, and foster experiments with respect to our undeveloped resources—and this would probably be no unprofitable investment of Colonial Revenue.

Synopsis of the Lycopodiaceæ of Guiana and their Allies.

By G. S. Jenman, F.L.S., Government Botanist of British Guiana.

Series II.

Order I.—Selaginellaceæ.

(Concluded from vol. v, part 1, p. 53.)

SPORANGIA of two kinds, larger and smaller; the former, macrosporangia, containing macrospores; the latter, microsporangia, containing microspores; borne separately in the axils of normal or modified leaves, in which they are single, and free or partially embedded; the macrosporangia being inferior in situation to the microsporangia.

This order consists of two very dissimilar genera if only the physiognomy or conformation of the respective members be regarded. They are associated however by the character which they possess in common, of the sporangia and spores being of two kinds, one larger than the other, generally considerably larger; each kind of the spores possessing separate sexual potentiality, generation resulting from the interaction of the contents of the cells that are produced on their germination; if this union is not effected the antecedent germs perish.

Genus I.—Selaginella, Beauv.

Sporangia bivalved, uniform, orbicular, or subglobose. Macrosporangia inferior, usually few, containing few large macrospores. Microsporangia superior, usually numerous, containing multitudinous minute microspores, borne in modified 4-gonal spikes, at the end of the branches. Leaves small or minute, generally of two kinds—rarely of one—major and minor, each kind bi-serial, imbricating or slightly apart, the larger series lateral and spreading from the axis obliquely or horizontally, the smaller intermediary, more or less in a line with and

dorsal on the axis and appressed thereto. Fronds generally pinnately divided, rarely simple, often decompound. More or less copiously leafy throughout. Prostrate, sub-erect, erect or scandent.

Selaginellas differ from their allies the club-mosses by possessing two kinds of sporangia and spores, the generally distichous arrangement of the leaves, which gives the stems a flattened appearance, their more or less prostrate or subscandent habit of growth, their uniformly communal association and, as a rule, terrestrial location. Three or four Lycopodia have a somewhat similar arrangement of their leaves, and a considerable number are terrestrial, and some too are communal, but among the Selaginellas these are nearly constant characteristics. In a few species, none of which are natives of this country, the leaves are all of one kind and multifarious, the stems being consequently convolute, as is the rule in the Lycopodia. In nearly all the species there is some variation of shape in the fronds, and in many this is considerable. Some by their habit of rooting along the rachis as the growth extends grow to an indefinite length and many species are more or less modified in size and outline by this habit. In some the leaves are the same distance apart on all the branches, but in the majority they are widest on the primary stem or rachis, being gradually closer on the outer ramifications. The ciliation or serration of the leaves is generally quite microscopical. They are moisture and shade-loving plants, and grow principally in forests on damp soils or moist ground, forming patches or dense carpets or banks of exquisite and, in the different species, variable shades of green; though a few species prefer some degree of exposure. In Europe and

North America Selaginellas are largely cultivated as decorative and ornamental plants in Fern houses. Their habit of growth enables gardeners to propagate the great majority of them rapidly and with ease by subdivision. This is the only use to which they are turned or which they are known to possess. All except three or four species have a very limited geographical range, and according to Mr. BAKER only three species are common to both the Old and New Worlds. Two-thirds of the species here described are confined to Guiana, so far as is at present known ; the rest extend only to Brazil and some of the nearly adjoining countries.

§ *Leaves of two kinds, major and minor. Spikes 4-gonal ; bracts uniform.*—Species 1–22.

† *Fronds prostrate.*—Species 1–9.

* *Species not exceeding a line wide across rachis and leaves.*—Species 1–4.

1. SELAGINELLA VALDEPILOSA, BAKER, Syn. Gen. Selaginella, p. 11. —Fronds delicate, pale green, quite prostrate, very slender ; linear and repent, simple or with few short branches, 1 li. w. over the leaves, terminating in a depauperated tail, having only small leaves, in shape like the minor series. Major leaves spreading, not quite horizontally, ovate, acute, subequilateral, the margin freely ciliated, most so on the upper side, ½ li. l., less w., with half their own width between them. Minor leaves also ovate, equilateral or nearly so, acute, but not spinulose pointed, hardly ¼ li. l. and less wide, both margins pubescent. Spikes a line or over l. ; bracts keeled.

JENMAN, n. 1484. Gathered in the deep ravines in the forest near the top of the Kaieteur Fall. Marked by its little branched, very narrow, linear fronds, which are 1–1½ in. l., terminating in a depauperated tail. The colour is exceedingly pale. The under side looks very pubescent, from the long marginal hairs of the rather auricled upper base of the lateral leaves which overspread

it. The pale colour is probably due to the little light that can penetrate to the deep chasms between the rocks in which it grows. Measured across the leaves, the diameter is the same throughout, from the base of the plant outwards, and the rachises are all of the same size and strength.

General distribution—Endemic.

2. **Selaginella dendricola, Jenman**, Gard. Chron. vol. 2, 1887.—Fronds prostrate, few to several inches long, consisting of a slender thread-like rachis and short, distant, usually simple or casually forked branches, $\frac{1}{4}$–$\frac{3}{4}$ in. l. Leaves extending to the base of the primary rachis; major ones $\frac{1}{4}$–$\frac{1}{2}$ li. each way, hardly pointed, the base subequally slightly cordate, nearly orbicular, horizontal, all except the outer ones more or less apart or distant; the latter contiguous or imbricated, and becoming gradually oblong in shape; minor leaves very minute, ascending, distant, ovate, acute. Spikes often crowded at the end of the frond, $\frac{1}{4}$–$1\frac{1}{4}$ in. l., 4-gonal; bracts sharply keeled, acuminate, and finely denticulate.

Jenman, n. 2323. Gathered on decaying logs in the forest opposite Bartica, Essequibo River, growing among, and often more or less concealed in, moss. It is a slender delicate species, apparently nearest *S. rotundifolia*, Spring. and *S. minima*, Spring. It has a curious duplex habit, the long main rachis having lax or distant leaves, which are nearly round, while the short branches and apex of the frond, which are fertile at the ends, have close or crowded oblong leaves. At the top of the frond the spikes are peculiarly long, a dozen often extending forward side by side; those of the distant lateral branches are shorter. The colour is a very pale green.

General distribution—Endemic.

3. **Selaginella diminutifolia, Jenman**, Gard. Chron. vol. 2, 1887.

—Fronds 1-2 or 3 in. l., half as wide or less, rooting chiefly at the base, but also frequently from the joints, two or three times pinnate, the branches short, alternate, contiguous or subdistant, ¾-1 li. w. over all, the outer ones hardly narrower than those of the main axis ; firm in texture, dark green. Major leaves spreading obliquely, contiguous, the outer ones imbricating, obliquely ovate, obtuse, ½ li. l., less broad, plain edged, the base obliquely cordate, much deeper on the superior rounded base, the auricle of which laps over the rachis. Minor leaves ovate, acute, equilateral, subcordate, imbricating on the outer branches, but not at the base of the stems, or hardly so, ¼ li. l., nearly as wide, slightly convex. Spikes not seen.

JENMAN n. 1481. Gathered on rocks at the foot of the Kaieteur Fall, a situation that if closely examined would probably yield several other species, new or old. On my visit, unfortunately, I had temporarily lost my sight from an attack of ophthalmia, which compelled my leaving the situation quite unexplored. Of this group of diminutive species this is most compact in its leafage, and most freely branched.

General distribution—Endemic.

4. SELAGINELLA MINIMA, SPRING., Mon. Lycop. p. 86. Baker, Syn. Gen. Selaginella, p. 60.—Fronds small, about 1 in. l., simple and linear, or simply and shortly branched, 1-1½ li. broad over all. Major leaves spreading, ovate-oblong, sub-acute, deeper on the upper side, the rounded auricle ciliate and lapping over the rachis, other parts of the margins bare, ½ li. l., rather less wide, lax or subdistant in the lower part, but in the outer close or slightly imbricating. Minor leaves nearly equilateral, but obliquely attached, ovate, acuminate or rather cuspidate, the margins faintly echinate, overlapping each other at the top of the fronds. Spikes 1-1½ li. l., as wide as the frond or wider ; bracts rather loose and spreading, hardly keeled, resembling the minor leaves of the fronds.

LEPRIEUR, Cayenne. This is the dwarfest of the known Guiana species, and in other respects, as well, a very distinct little plant. On the lower part of the stem

the leaves are separate, while in the outer part or in the short branches they are close or crowded. The spikes are generally wider than the fronds, the bracts spreading rather openly, only half folded, in shape like the intermediary leaves. The ciliation of the auricle of the lateral leaves is rather long, and gives the underside a pubescent appearance.

General distribution—Endemic.

** *Rachises exceeding a line wide over the leaves.*—Species 5-9.

5. SELAGINELLA KAIETEURA, JENMAN, Gard. Chron. vol. 2, 1887.—Fronds quite prostrate, rooting freely along the axis, herbaceous, dark-green, 3-4 or 6 in. l., with pinnatiform, sub-distant, short branches, which are usually again shortly branched in like manner. Rachis firm, stramineous, leafy to the base, 1½-2 li. w. over all. Major leaves oblique, contiguous, most apart at the base of the stem, imbricating on the outer branches, 1-1½ li. l., 1 li. w., very inequilateral, obliquely ovate-deltoid, obliquely cordate at the base, the auricled superior side very disproportionately deep, point obtuse; margins plain. Minor leaves ovate, the bases slightly overlapped, cordate and nearly equilateral, acute, ¾ li. l., and nearly as w. Spikes short, bracts convex or keeled, acute.

JENMAN, n. 1480. Gathered on the rocks at the foot of the Kaieteur Fall. This has some resemblance to *S. platyphylla*, but the branches are nearer, the leaves close, broader in relation to the length, the upper side being so disproportionally wide as to produce an obliquely deltoid outline, though those at the ends of the branches, which are crowded and imbricating, are more equally cordate, and in all cases the one at the base of each branch is strictly heart-shaped, both sides being equal, as is the case in some other species. My specimens are only slightly in fruit, and it is probable the spikes are longer than I have described.

General distribution—Endemic.

6. SELAGINELLA POTAROENSIS, JENMAN, Gard. Chron. vol. 2, 1887.—Fronds quite prostrate, with delicate filiform roots at the joints, 2-4 in. long, with short distant alternate branches, which are simple or again shortly branched, flaccid and delicate. Rachises very slender, and thread-like, brightly stramineous, leafy to the base, 2-2½ li. w over all. Major leaves spreading, distant, becoming gradually contiguous, but not touching, on the outer parts; obliquely ovate, broadly acute, obliquely cordate, but narrowed at the base, the superior base very slightly auricled, 1¼ li. l., ¾ li. b., the margin plain; colour light straw green. Minor leaves much reduced, distant, situated at the base of the major, inequilateral, attached by the inner side of the base obliquely ovate, cuspidate, about ¼ li. l. Bracts ovate-lanceolate, imbricating but slightly open.

JENMAN, n. 1818. Gathered in ravines in the forest near the Kaieteur Fall. A species well marked by its bright straw colour, very slender, conspicuous, yellow rachises, distant, ovate, lateral leaves, which seem at sight, though they are not really, narrowed equally each way, and very minute medial ones. The latter are so small that they can only be seen by the aid of a lens. When a frond is looked at on the under side with a lens they are seen projecting like a small auricle against the inferior base of the major leaves. In the longer spikes, some of which are nearly half-an-inch long, the bracts are imbricated moderately firmly; but in the shorter ones, a line or so long, they are lax, and seem, as is often the case in that state, somewhat disposed to be, but are not, resupinate.

General distribution—Endemic.

7. SELAGINELLA PRODUCTA, BAKER, Syn. Gen. Selaginella, p. 33.—Fronds prostrate or suberect, rooting at the base, and on the stem at intervals as well, an inch or two to a foot l., oblong, lanceolate or ovate, with contiguous, nearly uniform, erect-spreading branches, 1–2 or 3 in. l. Major leaves oblong, spreading horizontally, deeper and auricled on the upper side at the base, the lobe overlapping the rachis beneath, 1–1½ li. l., ½ li. or over w., very faintly spinulose-ciliate on the rounded

base, those of the rachises a little apart, of the final branches close but not imbricating. Minor leaves ovate, cuspidate, somewhat keeled, and partly overlapping, ½-1 li. l., less w., the margins spinulose-ciliate. Spikes square, copious, often crowded round the frond, ¼-1 in. l.; bracts densely imbricated, not or little spreading.

APPUN, n. 196 and 198; DRAKE; JENMAN, 783 and 1483. A very common species, growing by the banks of rivers and in damp places often submerged, forming dense patches or beds. The lateral leaves are rather broad, oblong or ovate-oblong, spreading horizontally. The intermediate ones are freely cuspidate with spinulose margins. I have gathered it on the banks of most of the rivers of the colony that I have visited.

General distribution—Northern Guiana to the Brasils.

8. SELAGINELLA GUYANENSIS, SPRING, Mon. Lycop. II. 134. Baker, Syn. Gen. Selaginella, p. 34.—Stems decumbent, above a foot long, subterete, copiously pinnate, the branches but little compound. Major leaves spreading, linear-oblong, middle sized, sub-obtuse, three times as long as broad, nearly equilateral, serrulate, subcordate, and shortly ciliate on the upper side at the base. Minor leaves very small, cordate-ovate, with a large cusp. Spikes square, ½ in. l.; bracts ovate, cuspidate, strongly keeled.

French Guiana, LEPRIEUR. This I have not seen.

General distribution—Endemic.

9. SELAGINELLA BREYNII, SPRING, Mon. Lycop. II, 119. Baker Syn. Gen, Selaginella, p. 23.—Fronds prostrate, with long straight roots at intervals beneath, 1-1½ ft. l. dark-green, herbaceous, oblong, with two or three frond-like divisions often springing from a common base the same shape and size, branched alternately throughout, the primary rachis stiffish. Branches contiguous but not close, 2-3 in. l. with shorter alternate branches. Major leaves spreading horizontally, linear-oblong, close or imbricating, inequilateral, the upper base auricled and deeper than the lower, overlapping, and very faintly pubescent, concealing the rachis beneath, 2-2½ li. l. ¾ li. w. the point sub-acute. Minor leaves, ovate, cuspidate, the margin finely serrate, inequilateral,

attached obliquely, the outer rounded side being much deeper than the inner, tbe two series close and slightly overlapping in the lines, rather keeled toward the freely cuspidate point. Spikes ½-1 in. l., 4-gonal often 2 to a final branch, or forked ; bracts densely imbricated, sharply keeled and pointed.

SCHOMBURGK n. 982. A large species most like *S. epirhizos* and *S. affinis* in its flat spreading parts, the leaves of which lap one over the other on the under surface and spread horizontally. The intermediate leaves are very unequal sided, run direct with the rachis, and are attached on the narrow or inner side of the base. The long slender white roots from the joints are numerous. Both above and below the rachises are quite concealed by the foliage. Gathered by LE PRIEUR as well as by SCHOMBURGK.

General distribution—Guiana and Brazil.

10. SELAGINELLA RORAIMENSE, BAKER, in Journ. Pro. Lin. Soc.—Fronds sub-erect or more decumbent, rooting only at and near the base, bi-tri- pinnate, leafy to the base, 3-5 in. l. 1-2½ in. br. Branches spreading laterally or converging forward, 2½ li. w. over the leaves, the major series of which are close or with as much as their own width between, nearly horizontal, acute, the base unequally sub-cordate, the upperside auricled, overlapping the rachis, and faintly spinulose, 1-1½ li. l. ½ li. w. Minor leaves ½ li. l. equilateral, cordate, the point acuminate, but not cuspidate, the margins faintly spinulose. Spikes square, ¼-1¼ in. l., often copious. Bracts keeled.

Roraima, IM THURN, n. 122. Gathered near the foot of the slope ; most abundant on the banks, which it covers, of the upper part of Macouria River ; JENMAN, n. 2324. A very near ally of *S. radiata*, for which without close comparison it might be mistaken, but a stiffer and more erect species. The range in altitude of the two localities above mentioned is the widest known of any of the local species.

General distribution—Endemic.

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11. SELAGINELLA RADIATA, BAKER, Syn. Gen. Sellaginella, p. 62. S. increscentifolia, Spring, Mon. Lycop., II., 106. Lycopodium radiatum, Aublet.—Fronds rooted at the base, with scattered leaves and no branches in the lower part; above this lanceolate, ovate or radiate, 2 or 3 times branched; branches 1–2 in. l., contiguous, erecto-spreading, 1–2 li. w. over all. Major leaves erecto-spreading or more patent, contiguous or with once or twice their own space between them on the branches and often more on the main rachis, subovate, acute, widest at the unequal base, the upper side rather auricled and lapping on the rachis, the rounded part freely ciliate (or both sides of the more equal sided leaves found at the axils), 1–1¼ li. l., ½ li. w. Minor leaves ovate, rather cuspidate the point weak and hair-like, inequilateral but not conspicuously so, attached by the inner base, apart, showing the rachis freely between them, ½ li. l. including the awn; both margins ciliate, but variable. Spikes square, very abundant, 2–6 li. l.; bracts ciliate margined, keeled, but little open.

A relatively small, much branched species, weakly and flaccid in substance, varying in the degree of ciliation, some plants being quite naked. It is 4-8 in. l., the stem often devoid of branches half the length, above which it spreads in a variable, lanceolate or broader form.

General distribution—Trinidad, Ecuador and Surinam to Brazil.

12. SELAGINELLA MARGINATA, SPRING, Mon. Lycop., II, 211. Flora Brasil, p. 127 Baker, Syn. Gen. Selaginella, p. 38.—Fronds with slender but firm and stiffish stems, rooted at the base, jointed, stramineous, with laxly scattered leaves, several inches to a ft. or over l. with sharp subdistant or distant 1-2. pinnated branches, which are 2 li. w. over the leaves; rachises terete, much exposed between the scattered leaves. Major leaves oblong, spreading nearly horizontally, with their own width or more between them, not cordate or auricled at the base, the upper side rather deeper than the lower and faintly ciliated on the edge, acute pointed, ¾–1 li. l. ½ li. w. Minor leaves minute, ovate-lanceolate, acuminate, inequilateral, slightly overlapping on the final branches. Texture firm; colour light green. Spikes very short, hardly more than 1 li. l.; bracts keeled, slightly open.

This seems to be in growth a semi-erect species, which

probably supports its slender fronds on other vegetation. The branches are rather distant, always short in relation to the length of the fronds, varying from 1–3 in. l. The habit of growth is probably that of *S. puberula*.

General distribution—Guiana and Central Brazil.

†† *Fronds sub-prostate.*—Species 10·18.

* *Rachises not exceeding* 2½ *lines wide over the leaves.*—Species 10-13.

13. SELAGINELLA FLAGELLATA, SPRING, Mon. Lycop II. 208, Baker, Syn. Gen. Selaginella.—Fronds trailing, intermatted, half-a-foot long, the lower parts copiously compound, the branches excurrent and whip-like at the end. Major leaves ovate-lanceolate, very acute, above a line long, pellucid, bright green, more produced on the upper side of tbe mid-rib, rounded at the base, shortly ciliated, and imbricated over the stem. Minor leaves one-third as long, ovate-acuminate, falcate, convergent. Spikes ⅓-½ in. long, bracts very acuminate, strongly keeled.

French Guyana, on rocks on the banks of the streams of the Upper Oyapok; LEPRIEUR. This I have not seen, and have quoted from Mr. BAKER'S Synopsis.

General distribution—Endemic.

** *Rachises* 2½-3 *lines wide over the leaves.*—Species 14-15.

14. SELAGINELLA CAUDORHIZA, BAKER, Syn. Gen. Selaginella, p. 36. —Fronds, rooted at the base, 8-18 or more in. l. ovate, with contiguous pinnæ in the lower part, but extending above into a lax narrower state, having short distant branches, the lower of which (not lowest which are less) 2-5 in. l., erecto-spreading, repeatedly pinnate. Major leaves of main rachises spreading, about 1¼ li. l. ¾ li. w. acutely pointed, rounded and nearly equal-sided at the base, with once to twice their own width between them. Minor leaves cuspidate, attached obliquely, the margins very faintly ciliate. Leaves of the branches the same shape but only half the size, close but not imbricating. Spikes 2-3 li. l.; bracts keeled, somewhat spreading

Surinam only, collected by HOSTMAN, in 1841. The growth seems to be sub-erect, as there are no roots along the frond between the base and the outer elongated part,

where they occur at the joints. The minor leaves are quite in a line with the rachis, and have sub-lateral attachment. The primary rachis is $3\frac{1}{2}$ li. across the leaves, the others are reduced branch by branch, till the final ones are only 2 li. w.

General distribution—Endemic.

15. SELAGINELLA MACROCLADA, BAKER, Syn. Gen. Selaginella, p 38. —Growth more or less prostrate, with simple thread like roots a few in. l. springiug at intervals from the jointed flexuose rachises. Branches very long and attenuated, having contiguous erecto-spreading branchlets at the base about 1 in. l., which gradually become distant and less than a $\frac{1}{2}$ an in. l. in the extended outer part. Breadth over all $2\frac{1}{2}$-3 li. Rachises ribbed or angular, exposed beneath. Major leaves oblique or in cases nearly horizontal, oblong, the under margins up-curved at the acute point, base subcordate, deeper on the upper side than the lower, margins not ciliated, 1-$1\frac{1}{2}$ li. l. and half as w. imbricating. Minor leaves lanceolate-acuminate, inequilateral, attached on the inner side, the outer side with a rounded auricle developed below this point; margins plain or very faintly serrated; texture firm; colour light green. Spikes short, bracts keeled.

APPUN n. 802. There is only one specimen, in the Kew Herbarium, on which no locality is stated by the collector. The species is well marked by the long attenuated character of the primary branches, secondary ones being all short. The specimen in question is over 2 ft. l. was apparently gathered near its base, and has about half a dozen of the long branches all of which run much in the same line. From the upcurved under margin the lateral leaves have the appearance of being slightly falcate.

General distribution—Endemic.

*** *Rachises 3–4 li. over the leaves.*—Species 16–17.

16. SELAGINELLA AFFINIS, A. BR. Baker, Syn. Gen. Selaginella, p. 40. S. Poeppigiana, Spring, Mon. Lycop. p. 217,—Fronds 1–$1\frac{1}{2}$

l. branched alternately nearly from the base, sub-prostrate, throwing out long simple thread-like roots from the joints, which like the rachises are stramineous and bright. Branches 2½-3 or 4 li. w. over the leaves; herbaceous in substance, and rachises weakly, though thickish. Leaves distant on the main rachises, but close or slightly imbricating on the branches; major ones linear-oblong, spreading sub-horizontally, the base not cordate, the under margin up-curved at the acute point, the upper side very little deeper than the lower, 1½–2 li. l., ¾ li. d., the margins naked. Minor leaves ovate-lanceolate or lanceolate, with a rounded auricle at the base of the longer outer margin, the point rather cuspidate. Spikes ¼–½ in. l. rachises enlarged at the base by the macrospores.

JENMAN, n. 551, 1479, 2061, 2134. Very close to *S. epirhizos*, but in that species the stems are not stramineous and bright, and the leaves on the primary rachises are close and all, including the minor ones, are broader than in this, with the rachises articulated at the joints, which this does not show. It is a very common species, forming large beds in the forests which border most of the rivers of the country.

General distribution—Endemic.

17. SELAGINELLA EPIRHIZOS, SPRING. Mon. Lycop. II. p. 218. Baker Syn. Gen. Selaginella p. 57.—Fronds sub-ascending, rooted at the base, and with long simple threadlike roots upwards some distance at the joints, 8-12 or more in. l., 2-3 in. br.; branches short and again shortly branched, or some developing into branches as large as the primary fronds. Major leaves spreading horizontally, oblong, acute or sub-acute at the point, the base deeper on the upper side but not auricled to lap over the rachis, except in the final branchlets, and the margins quite plain, 1½-2½ li. l. ¾-1 li. w. at the base, apart on the main rachis, but becoming gradually imbricating on the final ones. Minor leaves 1-1¼ li. l. obliquely ovate, unequal sided, acute pointed, attached on the inner side at the base of the narrower half, slightly overlapping; margins quite plain. Rachis broad and prominent, flexible, fully exposed on the under side; texture herbaceous; colour dark green. Spikes 2-5 li. l. decrescent, much bulged out at the base with the macrospores, which are unusually large.

French Guyana, LEPRIEUR; Surinam, HOSTMAN; British Guiana, JENMAN n. 645, Mazaruni and Issororo Rivers. The branches are very flat, and measure 4-5 li. over all. As in *S. caudorhiza*, the lateral leaves do not lap on the upper base over the rachis, except in the outer branches, where the character is soon lost. The bulging out of the bracts at the base of the spikes with the large macrospores is a good feature. It is one of the limp weakly species, though the parts are relatively large.

General distribution—Endemic.

††† *Fronds upright.*—Species 18-21.

* *Fronds rigid.*—Species 18.

18. SELAGINELLA VERNICOSA, BAKER, in Lin Soc. Jour.—Fronds rooted at the base, stiff, 3-6 or more in. l. with short alternate distant or sub-distant divaricating branches on which the fertile branches are produced in a similar and divaricating manner. Primary rachis 1½ li. across the leaves, the branches 1-1¼ li. across; convex on the under side, concave on the upper. Major leaves densely imbricating, obliquely spreading, auricled and deeper on the upper side, the end rounded, the upper margin much curved and finely spinulose-serrate, the under naked and nearly straight, about ½ li. l. less w. Minor leaves very densely imbricating, the two lines also laterally overlapping, ovate, acute, equilateral, both margins freely ciliate, about ⅓rd li. l. Spikes 3-4 li. l. terminating all the branches; bracts keeled, rather open.

VAR. SIMPLICIFRONS.—Branches erect, all reaching forward parallel with each other; rather narrower. Margins of the leaves less ciliated. Spikes firmer and more angular.

IM THURN, n. 226. Roraima, base of the cliff. This is a stiff rigid species, with densely imbricating leaves that entirely enclose and conceal the rachises. The physiognomy is quite different from that presented by any of the other species. The variety, IM THURN, n. 381, was gathered lower down near the encampment. It has no spreading lateral branches like the type, they

ascend side by side, are simple, and are forked when divided, the shorter ones being fertile. Possibly it is a distinct species.

General distribution—Endemic.

** *Fronds scandent.*—Species 19.

19. SELAGINELLA PUBERULA, KLOTZSCH.—Spring Mon. Lycop. II. 160. Baker Syn. Gen. Selaginella, p. 76.—Stems repent, throwing up close ascending stems which are terete, stramineous or brown below and glossy with scattered appressed leaves, and no branches for a space 3-6 in. from the base. Fronds much elongated, 1-2½ ft. or more l. 2-4 or 5 in. broad, but generally about 2-3 only; rachis like the stems, terete. Branches alternate, 1-2 in. l. as much apart, erect-spreading, again branched, final ones 1-1½ in. l. 1½-2 li. w. over all. Major leaves imbricating, spreading nearly horizontally, slightly curved to the acute point, broadest at the base, cordate and rather auricled, the upper side wider, and ciliate-edged, ½-¾ li. l. about half as wide; the minor leaves imbricating, minute, sub-equal-sided, attached by the rather shorter inner base, ovate, mucronate, ⅓ li. l. Spikes 4-stichous ½-1¼ in. l. enlarge at the base or not with the macrospores.

RICH. SCHOMBURGK, n. 979. This is clearly a semi-scandent species. It varies slightly in the ciliation or nakedness of the leaves, and in the stem being puberulous or not. It has a repent stem from which the fronds are thrown up at short intervals apart. These have a petiole clear of branches, a few inches long, above which the narrow fronds extend 1½-2 ft. or more, supported on bushes, or other surrounding growth. The slender terete main rachis is exposed to the top, but furnished with scattered leaves, which are in three series and appressed to the surface, in a line with the rachis, and therefore distinct in character from the lateral spreading leaves.

General distribution—Guiana, Brazil and Peru.

*** *Fronds spreading more or less flabellately and decompound.*—Species 20-21.

20. SELAGINELLA HÆNKEANA, SPRING, Mon. Lycop. p. 187. Baker, Gen. Selaginella, p. 76.—Stems erect, strong, angular clothed with scattered leaves. Fronds erect, regularly pinnate or flabellate, 5-8 in. each way, firm, dark green above, silvery beneath. Pinnæ numerous, much branched and crowded, so that the habit is often plumose in growth; rachises 3-4 li. w. over all. Final branches 1½-2 li. b. Leaves of the former apart, of the latter close, spreading obliquely, oblong, acute, the base cordate and rather auricled, the rounded and upper side ciliate, the larger 1½-2 li. l. and ¾-1 li. w. the smaller half that size. Minor leaves minute, ovate, terminating in a hair-like awn, rather inequilateral, the margins faintly serrate. Spikes very small, a li. l. with small, laxly spreading, bracts which are hardly keeled.

Cayenne, gathered by LEPRIEUR and SAGOT. Well marked by the much-branched, crowded habit. Mature fronds when pressed have the parts lying one over the other. The beautiful silvery underside, and very short loose spikes in which the bracts are hardly changed in character from the intermediary leaves, and the sporangia are fully exposed, are also good distinguishing characters. It resembles most in the outline of the fronds the next species.

General distribution—Guiana and Brazil, Bolivia and Chili.

21. SELAGINELLA PARKERI, SPRING, Mon. Lycop. p. 226. Baker, Syn. Gen. Selaginella, p. 79. S. lucidinerva, Spring. Lycopodium Parkeri, Hook et Grev. L. plumosum, Aublet.—Stems strong, quite erect sub-angular, or quadrate upwards, stramineous, jointed at intervals, sparsely furnished with appressed leaves, and spreading by stoloniferous shoots which spring from the joints and trail on the ground or ascend banks, rocks, or the base of trees, 6 in.-1 ft. or over l. Fronds spreading from the top of the stems, digitato-pedate or flabellate, 4-10 in. each way, composed of numerous forked, spreading pinnate branches, with a flexuose rachis 3-4½ li. w. over all. Major leaves spreading horizontally, close, in the final branches imbricated, oblong, the under

margin curved upwards at the acute point, nearly equal sided, the base semi-cordate, with a small auricle on the lower side, $1\frac{1}{2}$-2 li. l. $\frac{3}{4}$ li. w. not expanded within; margins plain or faintly serrate on the rounded but unenlarged upper side. Minor leaves lanceolate-acuminate, or on the main rachises subovate, attached by the base of the inner side, that of the outer being extended below this into a small auricle, $\frac{1}{2}$-$\frac{3}{4}$ li. l.; margin not ciliated. Texture firm; rachises stiff; colour bright green. Spikes 2-5 li. l. enlarged at the base with the large macrospores; bracts keeled, edges naked, slightly spreading.

Var. S. STELLATA, Spring, Mon. Lycop. II, p. 228. Fl. Brasil, p. 129.—Branches rather narrower, and the leaves consequently smaller. Fronds more regularly pinnate than flabellate, the main rachis extending into a long radicant tail. Spikes 4-6 li., l. quadrate.

Var. PEDATA, Klotzsch, in Linnæa xxviii, 521.—Leaves rather smaller and the branches consequently narrower, spikes quadrate, from $\frac{1}{4}$-1 in. l.

Gathered by all collectors. Well marked by its erect, flabellate, or often digitate habit, zigzag rachises, and the leaves of both kinds slightly auricled on the outer side at the base. As the leaves do not overlap the rachises, the latter are exposed beneath, but above they are quite concealed in all the outer branches. The short spikes are often bent aside by the large macrospores being on one side, and when very short are as broad as long, looking nut-like at the ends of the branches. Sometimes the fronds or stems produce depauperated branches with small, lax, rather rounded leaves, which look like a totally different species. None of the states of this species is quite constant to a fixed outline of frond, and in any good set of specimens it varies from digitate or flabellate, to regularly pinnatiform. The varieties have the same range as the type.

General distribution—Guiana and the Brasils.

§§ *Leaves of two kinds, major and minor. Bracts also of two kinds,*

the larger series following the smaller normal leaves, and the smaller the larger leaves.—Species 22-24.

* *Rachises not exceeding one line wide over the leaves.*—Species 22.

22. SELAGINELLA RHODOSTACHYA, BAKER in Lin. Soc. Trans.—Fronds prostrate with fine descending roots along the main and other rachises, leafy to the base, slender, the lower part not branched, 6-9 in. l., 1½-2 in. w., 3-pinnate, the branches distant, and irregular in length. Major leaves spreading, with two or three times their own space between them, ovate, rounded at the end, equilateral, the margins faintly ciliate or naked, ¾ li. l., ½ li. w., delicate but firm in texture, very pale green; minor series similar in shape, but acute, hardly at all or little or much reduced, close, distant or sub-distant, the margins also slightly ciliate or naked. Spikes very short, 1-1½ li. l., the bracts conform with the leaves, lax, those of the upper side not much enlarged, slightly ciliate on the edges. All the rachises quite terete and stiffish.

IM THURN, n. 226; base of cliff, Roraima. This by the variation in its leafage in the same fronds is a peculiar species. In some of the specimens the lateral and intermediary leaves are exactly alike in form and size; in others the lateral are slightly larger; and in others again very decidedly so. The only modification seen in the bracts is that in some instances they are slightly keeled, and the superior series are not much larger than the inferior, but the difference is decided and obvious. Though very slender, the species has a firm, rather wiry look.

General distribution—Endemic.

* *Rachises exceeding one line wide over the leaves.*—Species 23-24.

23. SELAGINELLA ANOMALA, SPRING. Mon. Lycop. II., p. 247. Baker Syn. Gen. Selaginella p. 95. Lycopodium Hook and Grev.—Fronds prostrate or sub-prostrate, forming overlapping patches in growth, leafy from the base, rooting or not along the rachis, varying from oblong to broadly ovate-deltoid or flabellate in outline, 2-3 or 4 in. each way, 2-3 times pinnately branched, the final branches in the

larger and broader fronds often crowded. Major leaves spreading nearly horizontally, the inferior ones contiguous, the outer imbricating, 1-1½ li. l., ½-¾ li. w., acute, broadened at the base, which is unequally cordate, broadly auricled and overlapping the rachis on the upper side; the margin plain or faintly spinulose. Minor leaves ascending, imbricating, ovate-lanceolate, acuminate-cuspidate, finely spinulose-edged. Spikes 2-8 li. l.; bracts in two series, those of the upper side twice as long as the under ones, the latter especially spinulose-edged.

JENMAN, n. 2322. Gathered in wet places in the forest opposite Bartica, Essequibo River. Well distinguished from *S. platyphylla* by its more compound and broad-spreading fronds, and smaller closer leaves. The leaves are so crowded and imbricated on the outer branches (which also are crowded in the larger fronds) that on the Herbarium sheets they have quite a spinulose aspect on the upturned underside. It was gathered in Cayenne by LEPRIEUR and SAGOT.

General distribution—Endemic.

24. SELAGINELLA PLATYPHYLLA, BAKER, Syn. Gen. Selaginella, p. 95.—Fronds prostrate, rooting along the rachis, leafy from the base, 4–6 in. l., linear-oblong, 2-pinnately branched, the branches short, sub-distant, alternate, longer primary ones ½–1½ in. l., secondary ones ¼–½ in. l. Rachises weakly, the primary 3 li. w. over the leaves, secondary 2–2½ li. w. Major leaves spreading horizontally, from once to twice their own width apart on the main rachis, becoming contiguous at the top, obliquely ovate-oblong, 1½–2 li. l., ¾ li. b., obtuse-acute, inequilateral, the upper base auricled, broadly rounded and ciliate, quite overlapping the rachis, the margin whitish and scariose. Minor leaves alternate, edged like the major, ovate, cuspidate, rather obliquely cordate at the base, but nearly equilateral, quite in line with the rachis. Spikes very short, lax. Bracts dimorphous, the larger lanceolate, the smaller ovate, hardly keeled, open, revealing the sporangia.

Var. *laxa.*—Major leaves more ovate, wider apart throughout, the auricled base quite plain. Texture thinner, and rachises slenderer and weaker.

JENMAN, n. 1482, ravines near the Kaieteur Fall; and

Mt. Ray-wa, n. 2131. Nearest to *S. producta*, but much less and more laxly branched, with more distant leaves, and quite different fruit spikes, which are only 1–2 li. long. The habit is flaccid, and it spreads quite flat on the ground or other surface that it may be growing on. The variety is a lax form (my n. 1819) also from the Kaieteur Fall region; a region abounding in ravines and great fissures between rocks, in which Selaginellas are plentiful. In this and the two preceding the bracts are of two kinds, larger and smaller, in which the order observed in the leaves is reversed, the smaller ones following on the larger leaves, and the larger on the smaller leaves.

General distribution—Endemic.

Genus II.—Iscetes, Linn.

Leaves herbaceous, from a few inches to a foot or more high, springing in a dense rosette from a thickened corn-like rootstock, acaulescent, the expanded base clasping, tapering thence upwards to the acuminate, often convolute, point. Sporangia contained in the axils of the leaves, partly immersed in the interior of the base, the macrosporangia in the inferior and the microsporangia in the superior ones. Macrospores spherical; microspores 3-gonal.

These, the Quillworts of Britain, are herbaceous bog or aquatic plants, with numerous leaves, appressed together at their expanded bases, from whence they taper rapidly to the much reduced point, the height varying with the different species, forming a dense rosette. Sporangia are concealed in the clasping bases, and must be sought for by removing the leaves. I have seen no Guiana species, but it is possible the genus may be represented in the higher regions as it is in the countries around, for which reason I include it. There are about fifty species. They chiefly

inhabit temperate regions, the great majority being distributed through North America and Europe, and in less abundance in Australasia, but only sparingly over the equatorial belt. There are five tropical American species, found mostly at high altitudes, extending from Cuba to the Andes of Peru. In the Journal of Botany for 1880 Mr. BAKER published a Synopsis of the genus, and described forty-six species.

Order II.—Marsileaceæ.

Rootstock free-creeping, slender, vernation circinate. Leaves linear-filiform, or 4-foliate, at the summit of slender erect petioles. Capsules scattered or serial on the rootstock or the base of the petioles, globose or ovate-oblong, coriaceous, 2-4-valved, dehiscent, sporangia membranous, indehiscent. Spores of two kinds, macrospores and microspores.

This order like the preceding contains two dissimilar genera. One, *Pilularia*, is confined to temperate regions, the other, *Marsilea*, to tropical, and it is here represented.

Genus I.—Marsilea, Lin.

Capsules stipitate, 1-2 li. diameter, serial on the rootstock or the base of the petioles, coriaceous, dehiscent, bivalved, containing numerous sack-like membranous transverse sporangia which contain both macrospores and microspores. Rootstock creeping. Leaves 4-foliate, at the summit of slender erect petioles.

These are small herbaceous plants that grow gregariously in still fresh water, floating on the surface, and are distributed through the tropical and the warm and cool temperate regions of the world. About forty or fifty species are known. The capsules are small pea or bean-like bodies, leathery in substance, containing a series of pale thinly membranous transverse sack-like cells, in which the spores stand lengthwise, 3-serial, the larger oblong, macrospores, forming one series, the central, and the smaller (microspores) two. The former are several

times larger than the latter, which, till removed, they quite conceal.

1. MARSILEA POLYCARPA, HOOK AND GREV., BAKER, Jour. Bot. vol. 24, p. 276.—Rootstock thick as small cord, free-creeping, naked, with filiform long descending roots, and scattered ascending petioles, that are slender, 4-8 in. l., naked. Leaves 4-foliate, terminal on the summit of the petiole. Leaflets wedge-shaped, the outer edge rounded, at first folded together, spreading subsequently; ¾-1¼ in. diameter each way, sessile, membranous, herbaceous. Venation reticulated, fine, with no primary ribs, anastomosing, forming narrow elongated linear meshes. Sporangia subglobose 1½ li. diameter, serial on the lower part of the stipes above a vacant space at the base, shortly stipitate, few or numerous, densely, tomentose, but becoming eventually naked.

Common in estates trenches, and other still water, covering the surface densely, with oxalis, or clover-like foliage, and spreading over large areas. The local form is larger than usual.

General distribution—From Cuba southward to Brasil.

Order III.—Salvinie.

Annual aquatic floating herbaceous plants, of small or diminutive size, with imbricating or pinnatiform fronds and membranous major and minor capsules, which are situated in the axils of the leave beneath, or in inferior clusters on branched filiform threads, and that contain, separately, sporangia of two kinds.

These are, in size, inconsiderable aquatic herbs, but they exist usually in great abundance, floating on the surface of still water, and are especially common in this country. The known species are about a score or more, which are spread through the torrid and the warm temperate regions of both hemispheres.

Genus I.—Salvinia, Schreb.

Small floating aquatic herbs, communal in habit, with serial fronds on a more or less shortly-extended rachis, entire, flat or partially folded

with close parallel pinnatiform veins, and tufts of numerous, descending, simple, villous roots. Capsules membranous, indehiscent, globose, clustered in descending panicles, singly at the end of short pedicels, borne among the roots, the smaller, which are fewer, superior, and on longer pedicels, containing few reticulated macrosporangia; the larger, inferior, more numerous, on shorter pedicels, containing multitudinous, reticulated microsporangia.

Like the next, all the plants of this genus bear a common general resemblance, differing mainly in the degree of elongation of the axis, and size, form, colour and vestiture of the leaves, &c. The capsules are globose, and hang in loose clusters among the leaves, each one on separate pedicels which radiate more or less from the common axis. Those containing the macrosporangia, though situated above, reach out beyond those containing the microsporangia, which are larger, having pedicels twice or more as long. The fruit, roots, and fronds all spring from the joints in the rachis, which is the thickness of moderately thin string, the intervening space being destitute.

1. SALVINIA AURICULATA, AULET. Guian. ii. 969, t. 367. BAKER Jour. Bot. vol. 24, p. 99.—Rachis horizontal, cord-like, nearly a line thick, puberulous with slight scales, extending a few inches and branching. Fronds contiguous or apart, two at each joint, spreading at right angles, on petioles $\frac{1}{4}$-$\frac{1}{2}$ in. l. which are clothed like the rachis, the blades folded at first, rounded, cordate at the base with rounded auricles, $\frac{1}{2}$-$\frac{5}{8}$ths. in. each way, herbaceous, cloudy-green, pubescent beneath, densely strigose above with elongated glands that are divided into three or four filaments at the end, and mixed with finer ones; veins very close and numerous. Capsules of microsporangia nearly 1 li. diameter about 2-6 in number, those of the macrosporangia half the size and about 1-3; both pubescent.

Var. S. OLFERSIANA, Klotzsch.—Fronds crowded, sessile, half as large Veinlets fewer.

Most abundant throughout the coast region of Guiana,

covering and quite concealing the still water in which it grows. In estates' trenches, ponds and ornamental waters, this plant is a pest, from the freedom with which it multiplies and the multitudinous number of the individuals. The capsules are two to nine in number, or perhaps more, about from one to three (sometimes none) of each cluster containing macrosporangia. The variety is from Cayenne, gathered by PORTEAU and SAGOT, n. 745, and I have not seen it.

General distribution—The type from Cuba to Brasil, and the var. French Guyana, South Brasil, and Paraguay.

2. SALVINIA RADULA, BAKER, Jour. Bot. Vol. 24 p. 98.—Rhizome horizontal, cord or thread-like, 1-2 or more in. l., branching, puberulous-scaly. Fronds in pairs, at right angles with the axis, shortly petioled, rather oblong, rounded, cordate at the base, but not deeply, the auricles rounded, $\frac{1}{2}$-$\frac{5}{8}$th in. l., less w., herbaceous, under side pubescent, upper striglose, colour metallic-green, veins close, numerous, no fruit seen.

This I gathered (JENMAN n. 1114) in the lake where the *Victoria regia* is growing wild in the forest of an island above the falls on the Essequibo River. The rhizome seems to extend less than in the preceding species, the leaves are more oblong, and the vestiture of the upper surface and the veins fewer, and the colour more of a glaucous green than in that species.

General distribution—Guiana to South Brasil.

Genus II. Azolla, Lam.

Very small communal floating weeds, branched, with minute imbricating leaves in a double series, sessile with no veins, a central rib only in each, the inferior smaller than the superior, and descending filiform simple villous roots, capsules situated in the axils of the leaves beneath, of two kinds, membranous, indehiscent; the larger, globose, containing

very numerous microspores; the smaller ovoid, containing a solitary macrospore.

The members of this genus also are communal in habit, and form a sheet over water, often quite concealing the surface. They are exquisite little plants in structure and colour, with minute imbricating leaves, varying from green to dark purple in colour, branched in the form of little prostrate trees. The species are about half-a-dozen, tropical and sub-tropical, found in America, Asia, Africa and Australia.

AZOLLA CAROLINIANA, WILLD., BAKER Jour. Bot. vol. 24, p. 100,—Entire plant ½-¾ in. each way, deltoid or flabellate in outline, pinnate or bipinnate, obtuse, lower branches longest, the lowest shortly branched again at the ends. Leaves all united at the axis, biserial on each side, those of the upper series larger, more fleshy, brighter coloured, more erect and less appressed, subovate, ½-¾ li. l. less broad; those of the under side gray, appressed one on the other.

Very abundant through the coast region, covering the surface of trenches and all still waters, on which, like *Salvinia*, it is an expensive subject for estates to keep down. The colour varies from light green to dark purple, but there seem to be two varieties—green shading to pink, and pink shading to deep purple, the former being larger in both plant and leaves. My specimens are not in fruit and I can obtain none in fruit as I write.

General distribution—Southern United States to South Brasil.

Some Experiments on Sugar Cane.

By E. E. H. Francis.

IN June 1885, I had the honour of reading a paper before the Royal Agricultural and Commercial Society showing that the proportion of sugar present in sugar cane was greatly overstated in books because the statements were based on mere calculations and not on actual determinations. Instead of *average* sugar cane containing "18 to 21 per cent of sugar", as the standard text books say, it was intimated that the amount of sugar in canes of the richest quality would seldom be found to exceed 16 per cent. On the same grounds, objections were made to certain "analyses" of canes made in this colony, and particularly to one of cane from Barbados, in which the proportion of sugar was given as 20·23 per cent.*

At the time the paper was written I had had no opportunity of analysing Barbados canes, and going on leave

* The error arising from the substitution of calculation for "determination" was subsequently fully acknowledged by the analyst in this case. Also Professor Harrison of Barbados, in his report for 1886 on the "Results obtained on the Experimental Field at Dodd's Reformatory," says, (p. 5):—"Another important point will be noticed upon examining Table No. 7 in which the distribution of the constituents in the juice and the megass is shown. It will be seen that the proportion of total sugar (crystallisable sugar and glucose) left in the megass is very much less than has usually been assumed. It has been an almost universal practice amongst chemists to calculate the proportion of sugar in the whole cane from the amount present in the juice extracted, by assuming that that left in the megass possessed the same composition. There exists

soon afterwards for nearly a year put a stop to my experiments. Within the last few months, however, I have received direct from Barbados, samples of cane from three different estates, the last of the three having been sent in answer to my request for the richest and best that could be procured. For those samples I am chiefly indebted to Mr. F. I. SCARD, chemist to the Colo-

at present especially amongst our older planters an impression that the extra amount of juice extracted from the canes by increased pressure is not so rich in sugars and contains more impurities than that expressed at a lower one. This was first explained by Dr. J. D. Maycock, in 1851–52 who considered that probably the juice in the sap vessels (fibro-vascular tissue) of the canes is not so rich in sugar as that of the cellular tissue, and that the walls of the former being very much stronger than those of the latter would resist a power that would crush and express the juice from the sugar-containing cells. That this is true was proved by Thomas Kerr, Esq., in experiments made by him in fractional crushing of the canes at the Bay Estate in March, 1852. He, however, did not appeciate, and neglected to point out, the influence of this upon the supposed composition of the canes. Early in last year, Mr. E. E. H. Francis, Government Chemist in Demerara, again examined into this question and showed conclusively that, in consequence of the difference in composition between the juice of the vascular and of the cellular tissues, the sugar cane does not contain the proportion of sugar which most writers on the subject have credited it with. The results of our experiments have fully corroborated Mr. Francis' conclusion, and have further shown that this difference is the greater, the less mature and complete the growth of the cane, and becoming much less in its effects on the composition of the whole cane where the growth has been perfected."

I may mention here that for some years prior to 1885 I was aware that the residual juice in megass was less rich in sugar than the juice that had been expressed, and consequently I never resorted to calculation in lieu of determination in analysing cane. It was only from finding that my analytical results did not agree with those of other analysts that caused me to look into the matter, and then direct attention to the fallacy underlying the method of calculation.—E. E. H. F.

nial Company, and to Mr. E. E. H. THORNE, chemist at Barbados. All the samples were remarkably fine specimens of the Bourbon or creole cane of the Island, and the best cane of each bundle was selected for analysis. Unfortunately the loss of moisture suffered by the canes from the time of cutting until they were analysed could not be ascertained. The samples sent by Mr. SCARD, by some mischance, were not weighed previous to shipment, and, although that necessary precaution was taken by Mr. THORNE, it was rendered useless by a portion of one of the canes in the weighed bundle having been stolen during transit. By many previous experiments, however, I have proved that canes kept for a week or ten days suffer an average daily loss from evaporation of from 1 to 1·5 per cent. The daily loss on the specimens in question was therefore taken at 1·25 per cent. As the canes were very juicy and probably were exposed a good deal during their journey, the loss may have been greater, but is hardly likely to have been less. The following figures show the actual results arrived at by analysis, and the assumed composition of the cane calculated therefrom on the basis of an average daily loss of 1·25 of water.

I.—Cane from Bushey Park Estate.

(Analysed 8 days after being cut. Loss of moisture 10 per cent.)

Bright yellow colour with a few red patches. Weight, 3·816 kilogrammes (original weight 4·240 k.) Length, 2·092 metres. Diameter, 4 centimetres. Length of joints, 7-12 centimetres. The cane gave 70·3 per cent. of juice by mill, of density 1·096 at 84 degrees F. equal to 12·6 degrees Bm.

100 parts by weight contained :—

JUICE.		CANE *(as received).*			CANE *(corrected for loss of moisture).*		
Sucrose ...	17·03	Sucrose ...	13·51	16·42	Sucrose...	12·16	14·78
Glucose ...	3·50	Glucose ...	2·91		Glucose ...	2·62	
Org. matter	2·21	Ash ...	0·42		Ash ...	0·38	
Ash ...	0·26	Fibre ...	14·51		Fibre ...	13·06	
Water ...	77·00	Water &c.	68·65		Water, &c.	71·78	
	100·00		100·00			100·00	

I.—Cane from Hampton Estate.

(Analysed 10 days after being cut. Loss of moisture 12.50 per cent.)

Bright yellow cane with green and red patches. Weight, 5·837 kilogrammes (original weight, 6·671 k). Length, 3·085 metres. Diameter, 4.5 centimetres. Length of joints, 10-12 centimetres. The cane gave 72·2 per cent. of juice by mill, of density 1091 at 80 degrees F. equal to 12·0 Bm.

100 parts by weight contained :—

JUICE.		CANE *(as received).*			CANE *(corrected for loss of moisture).*		
Sucrose ...	17·18	Sucrose ...	13·73	16·16	Sucrose ...	12·01	14·14
Glucose ...	2·77	Glucose ...	2·43		Glucose ...	2·13	
Org. mattter	1·56	Ash ...	0·33		Ash ...	0·29	
Ash ...	0·19	Fibre ...	11·95		Fibre ...	10·46	
Water ...	78·30	Water ...	71·56		Water ...	75·11	
	100·00		100·00			100·00	

III.—Cane from Claremont Estate.

(Analysed 10 days after being cut. Loss of moisture 12·50 per cent.)

Bright yellow cane with red patches. Weight, 4·134 kilogrammes (original weight 4·714 k.) Length, 2·034 metres Diameter 4·5 centimetres. Length of joints, 7-11 centimetres. The cane gave 63·8 per cent. of juice by mill, of density 1104 at 86 deg. F. equal to 13·6 deg. Bm.

100 Parts by weight contained:—

JUICE.		CANE (as received).			CANE (corrected for loss of moisture).		
Sucrose ...	19·65	Sucrose...	15·76	18·54	Sucrose ...	13·79	16·22
Glucose ...	3·35	Glucose...	2·78		Glucose ...	2·43	
Org. matter	1·29	Ash ...	0·48		Ash ...	0·42	
Ash... ...	0·31	Fibre ...	14·13		Fibre ...	12·36	
Water ...	75·40	Water ...	66·85		Water ...	71·00	
	100·00		100·00			100·00	

The first two samples of cane although yielding abundance of juice of great saccharine richness must have contained at the time of reaping considerably less than 16 per cent. of total sugar; and the third sample with juice of an original density of about 12 deg. Bm. only slightly exceeded that amount, presuming that the loss of moisture has not been under-estimated. Prof. HARRISON in the Report cited in the footnote on pp. 60 and 61, specifies several parishes in Barbados where average canes contain from "16 to 16·50°/₀ of total sugars", but, for reasons that will be given subsequently, it is probable that this is an exaggerated estimate; and I think it is still unproved, and

likely to remain unproved, that *average* canes in Barbados or anywhere else contain as much as 16 per cent. of sugar. The experiments made at the Government Laboratory have, I think, fairly established the fact that a higher percentage of sugar than 16 need scarcely be looked for in canes yielding juice of a lower density than 12 deg. Bm. According to one of the oldest writers on the cane sugar industry (DUTRONE LA COURTURE; *Sur la canne a sucre et l'art d'en extraire le sel essentiel.*—Paris, 1790) cane juice varies in density in the West Indian colonies from between 5 to 14 deg. Bm. This statement seems never to have been corroborated, and has been often challenged, yet it has been handed down by successive writers and is to be found in many standard books of the present day. By keeping cane possessing juice of a high density, say 12 deg. Bm., for a week or two before grinding, it is quite possible to raise the density of the juice to 14 deg. Bm. or above, but I believe there are no satisfactory observations recorded, proving that fresh juice has ever shown such a density. It is highly probable that the French writer's statement is founded upon observations made without due regard to the increase in density that the juice in cane experiences on keeping.*

* Dutrône's writings seem to have been extensively drawn upon by compilers. Péligot writing in 1839 about the treatise on sugar cane by G. R. Porter (1830) complains that: "In his chapter on the composition of the juice of the cane, the author translates without scruple the chapter of Dutrône on this subject, and does not suspect that, in the space of fifty years, these opinions could be somewhat modified, in consequence of the progress of science and the chemical arts". It is also curious to find in the most recent work on *Sugar Growing &c.* a prominent position is given, but without acknowledgment, to Dutrône's description and diagrams of the structure and development of the plant, taken apparently from Porter's book.

Concerning the relation that exists between the density of juice and the sugar contents of the cane, the following observations may be considered worthy of attention.

By dividing the percentage of total sugar present in different samples of cane by the number of degrees Bm. shown by the juice, fairly uniform quotients are obtained, although the canes themselves may exhibit great difference of composition. This is shown by the table on page 69, compiled from the results of analyses made at the Government Laboratory of 33 samples of cane of various sorts taken at random.

The meaning of the column headed P÷B° may be taken as 1·35, and serves as a useful factor for arriving approximately at the percentage of sugar in a sample of cane from the density of the juice in Bm. degrees. This simple method, needing no chemical process whatever, gives more accurate results than the method of partial analysis described by Professor HARRISON as being almost universally practised by chemists. For example, a sample of cane was found to contain 12·99 per cent. of fibre, and yielded juice of 11·2° Bm. containing 19·97 per cent. of total sugar. The percentage of sugar in this cane would have been represented by the chemists in question as 17·67, whereas the actual percentage was only 14·65. Now by multiplying the number of degrees Bm. by 1·35, the number 15·12 is obtained, which is only 0·47 in excess of the true percentage, as against 3·02. The extent to which this simple rule can be trusted may be ascertained by comparing the figures in the column headed "B° × 135"

with the actual percentages, also given in the table, as determined by complete analysis.*

It may also be pointed out that a single factor applied indiscriminately as in the table to canes of very various kinds, may not give such closely accordant results as one specially determined for a particular kind of cane, as, for instance, the creole cane of this colony. Moreover, the analyses on which the table is founded are not all of equal value ; several consist of the earlier ones made at the Government Laboratory before the best way of conducting the analysis had been arrived at, and before experience had shown the necessity of attending to certain details and precautions in carrying out the operations. The analysis showing the lowest quotient —that of the first Barbados elephant cane—was one of the earliest ones, and was made only with great difficulty. The cane was so brittle that it broke in short pieces on being ground, and before the washing out of the sugar could be completed the megass was in powder. The cane was very large and unwieldy and an enormous quantity of water was used to wash the fibre free from sugar. I have very little doubt if this analysis

* By means of this factor some idea can also be obtained of the composition of the canes, which, analysed some 50 years ago have served ever since as examples for our text books and sugar authorities, and as a basis on which to rest much unmerited censure of the cane sugar industry. Thus, Casaseca (about 1840) analysing cane yielding juice of 11° Bm. and containing 16·4 per cent. of fibre, estimated the sugar present at 17·7 per cent. Péligot, in 1839, operating with cane giving juice also of about 11° Bm., and containing 9·9 per cent. of fibre, estimated the sugar at 18 per cent. Probably neither sample actually contained more than $11 \times 1{\cdot}35 = 14{\cdot}85$ per cent. Dupuy in 1840 gave 17·8 as the percentage of sugar in cane yielding juice of $10{\cdot}5^\circ$ Bm., whereas the actual quantity could not have been far from 14·2°/₀.

could be repeated with the more perfect appliances and methods now used at the Government Laboratory, a higher percentage of sugar would be shown, together with a closer correspondence of the quotient with those given by more recent analyses.

I have also calculated the factor corresponding to the degree Bm. of average *juice* of canes grown in this colony. The usual table relating to Bm.'s hydrometer refers only to pure sugar solutions, and nothing in the way of correcting the indications of the instrument for the impurities in saccharine juices appears to have been attempted, if we except a short, and to me, incomprehensible table compiled by Dr. ICERY, which is sometimes met with in books. The non-saccharine constituents of cane juice, at all events in the West Indies, do not greatly vary in quantity, consequently the corrected indications of Bm. give results differing but slightly from those furnished by analysis. The table which will be found on page 70 showing this is founded upon the analysis of 40 samples of juice from canes of various kinds.

KIND OF CANE.	Degrees Bm. of Juice = B°.	Per cent. total Sugar in Cane = P.	P ÷ B°	Per cent. fibre.	B° × 1.35.
Singapore Elephant	9.5	12.94	1.36	11.61	12.82
Mauritius "	9.7	12.77	1.32	9.79	13.09
" "	9.4	13.39	1.42	10.06	12.69
Singapore "	9.4	13.13	1.36	12.87	12.69
Barbados "	10.4	12.63	1.21	13.42	14.04
" "	11.2	13.99	1.25	12.43	15.12
Honolulu	11.2	15.24	1.36	12.28	15.12
"	12.0	15.58	1.30	12.23	16.20
Colony Cane	11.0	15.07	1.38	13.13	14.85
" "	9.4	13.57	1.44	10.18	12.69
Chicago	8.5	12.55	1.47	10.42	11.47
Queensland Creole	9.8	13.30	1.36	10.90	13.23
Rappoe	9.7	13.58	1.40	10.47	13.09
Striped Singapore	10.1	14.07	1.39	9.58	13.63
Meera	8.9	12.37	1.39	9.90	12.01
Lahaina	9.0	12.40	1.38	10.44	12.15
Barbados Elephant	8.8	12.21	1.39	8.03	11.88
Purple Mauritius	9.0	12.66	1.41	10.07	12.15
Selangore	8.7	12.49	1.43	8.49	11.74
White Mauritius	8.3	11.42	1.37	9.02	11.10
Keening	10.0	13.35	1.33	8.97	13.50
Colony Cane	9.7	13.19	1.36	11.42	13.48
Barbados Creole	12.0	16.16	1.35	11.95	16.20
Honolulu	10.4	13.88	1.33	9.80	14.04
Lahaina	10.2	14.00	1.37	10.38	13.77
Colony Cane	11.0	14.88	1.35	12.85	14.85
" "	11.4	14.25	1.25	13.25	15.39
" "	11.0	13.11	1.29	14.15	14.85
" "	11.0	14.38	1.30	14.07	14.85
" "	11.0	14.65	1.31	12.99	14.85
" "	9.8	13.08	1.33	12.08	13.23
Barbados Creole	12.6	16.42	1.30	14.51	17.01
" "	13.6	18.54	1.36	14.13	18.36

No.	Degrees Bm. = B°.	Per cent. total sugar = P'.	P' ÷ B°.	B° × 1·65.	No.	Degrees Bm. = B°.	Per cent. total sugar = P'.	P' ÷ B°.	B° × 1·65.
1	11·0	19·12	1·73	18·15	21	10·2	16·92	1·66	16·83
2	10·9	18·76	1·72	17·98	22	8·8	14·56	1·65	14·52
3	11·0	18·96	1·72	18·15	23	9·0	14·80	1·64	14·85
4	11·4	18·87	1·65	18·81	24	8·7	14·14	1·62	14·35
5	11·0	18·70	1·70	18·15	25	8·3	13·08	1·57	13·69
6	9·5	15·61	1·64	15·67	26	10·0	15·42	1·54	16·50
7	11·5	18·93	1·65	18·97	27	9·8	15·97	1·63	16·17
8	10·4	16·62	1·60	17·16	28	13·6	23·00	1·62	22·44
9	11·2	18·88	1·68	18·48	29	11·1	18·95	1·71	18·31
10	9·4	15·84	1·68	15·61	30	11·4	19·52	1·71	18·81
11	9·7	15·65	1·60	16·00	31	9·7	15·89	1·64	16·00
12	9·4	15·68	1·67	15·51	32	9·8	16·29	1·62	16·17
13	9·8	16·45	1·68	16·17	33	12·0	18·96	1·58	19·80
14	8·5	14·34	1·69	14·02	34	12·0	19·95	1·66	19·80
15	9·8	16·14	1·65	16·17	35	12·7	20·53	1·62	20·95
16	9·7	16·13	1·66	16·00	36	11·0	17·70	1·61	18·15
17	10·1	16·58	1·64	16·66	37	6·3	10·55	1·67	10·39
18	8·9	14·61	1·64	14·68	38	9·8	16·52	1·69	16·17
19	9·0	15·07	1·67	14 85	*39	11·2	19·69	1·77	18·48
20	10·4	16·52	1·59	17·16	*40	11·2	16·54	1·51	18·48

Excluding the last two samples (marked*) as being unusual or incorrect, the remainder give a mean quotient of 1·65, and this number may be used as a factor for calculating the total sugar percentage of a juice, from

the number of degrees Bm. A comparison of the figures in the column headed "$B^{o} \times 1{\cdot}65$" with those under the heading "per cent. of total sugar" will show the degree of accuracy obtainable. As before mentioned it is likely that even more accordant figures would be obtained by determining a factor for a particular kind of cane instead of using a single one for the juice of many kinds. Such a factor affords a very simple means of ascertaining the approximate value of juice when a polariscope is not at hand, especially if supplemented by the copper test for glucose. Even when a polariscope is employed it is useful for checking the analytical results arrived at. For example, in Professor HARRISON'S report already mentioned, the quotients resulting from the application of the rule to his analyses of cane juice are in most instances much too large. The quotient obtained by dividing Bm. degrees into pure sugar solutions of a corresponding strength is 1·80, but a higher quotient than that is obtained in no less than five instances from Prof. HARRISON'S results, while many others closely approach it. Therefore, either the determinations are incorrect, or, what is absurd, there must have been more sugar in the cane juice than would be present in pure sugar solutions of the same density, notwithstanding the presence of large quantities of non-saccharine matter. Examining the analyses further, it appears that other constituents of the juice have been over-estimated, for the percentage of total solids present in every case is considerably greater than juice of the given density would contain in solution. This is shown by the table on page 74, which contains a summary of Prof. HARRISON'S analyses

of 21 samples of cane juice. The samples marked with an asterisk are those to which a greater percentage of sugar has been assigned than sugar solutions of the same density could contain. Line viii. shows the approximate excess of total solids estimated from the density, and line ix. the result of multiplying the degree Bm. by 1·65, the figures thus obtained serving for comparison with the percentage of sugar in line iii as found by Prof. HARRISON.

That the amount of total solids in cane juice is fairly well represented by the amount of solid matter (as sugar) indicated by the density is evident from the following experiments. They were carefully made by quickly weighing 5 cubic centimetres of juice in a broad platinum basin, and evaporating over a steam bath until the solid residue lost less than a milligramme in weight an hour. In some of the trials, alcohol was added to the contents of the basin during the evaporation, taking care to decrease the heat to prevent loss from ebullition. No particular advantage seeming to be derived from the alcohol, its further use was stopped. The following are the results obtained:—

	1	2	3	4	5	6	7
Density of juice	1041	1104	1083	1073	1058	1072	1073
Degrees Bm.	5.7	13·6	11.1	9·8	7·9	9·7	9·8
Per cent. solids (as sugar) indicated ...	10·20	24·60	20·10	17·70	14·20	17·50	17·70
Per cent. solids as determined	10·31	24·92	20·16	17·87	14·14	17·70	17·72

It will be noticed that the presumed excess in Prof. HARRISON'S results shewn by line viii. is fairly uniform, and probably originates from some systematic error that can easily be explained and rectified. I am sure that

No. of Sample.	1	2	3	4*	5	6	7*	8	9	10	11*	12	13	14	15	16*	17	18	19	20*	21
i. Density ...	1073	1070	1069	1072	1072	1071	10·73	1070	1069	1070	1070	1073	1076	1073	1072	1070	10·70	1072	1070	1069	1069
ii. Degs. Bm. ...	9·8	9·4	9·3	9·7	9·7	9·5	9·8	9·4	9·3	9·4	9·4	9·8	10·2	9·8	9·7	9·4	9·4	9·7	9·4	9·3	9·3
iii. Total Sugar ...	16·15	16·36	16·25	17·65	16·80	17·02	17·83	16·50	16·08	16·41	17·02	17·09	17·46	16·44	16·77	17·06	16·26	16·46	16·83	17·00	16·70
iv. Ash	0·28	0·28	0·33	0·24	0·22	0·26	0·18	0·20	0·22	0·26	0·29	0·26	0·22	0·24	0·24	0·28	0·26	0·27	0·22	0·20	0·28
v. Org. matter ...	3·47	2·59	2·17	1·24	2·26	1·77	1·72	1·62	2·91	2·65	1·92	2·29	3·39	2·66	2·28	2·01	2·71	2·84	2·35	1·71	2·01
vi. Total solids ...	19·90	19·23	18·75	19·13	19·28	19·05	19·73	18·32	19·21	19·32	19·23	19·64	21.07	19·34	19·29	19·35	19·23	19·57	19·40	18·91	18·99
vii. Solids (as sugar) = Bm. ° ...	17·70	17·00	16·80	17·50	17·50	17·20	17·70	17·00	16·80	17·00	17·00	17·70	18·40	17·70	17·50	17·00	17·00	17·50	17·00	16·80	16·80
viii. Approximate excess of total solids	2·20	2·23	1·95	1·63	1·78	1·85	2·03	1·32	2·41	2·32	2·23	1·94	2.67	1·64	1·79	2·35	2·23	2·07	2·40	2·11	2·19
ix. Bm. × 1·65 ...	16·17	15·51	15·34	16·00	16·00	15·67	16·17	15·51	15·34	15.51	15·51	16·17	16·83	16·17	16·00	15·51	15·51	16·00	15·51	15·34	15·34

my adverse criticism on this portion of his otherwise admirable work, will be taken in good part by Prof. HARRISON, not only because errors of the kind require to be corrected at any cost to personal feeling, but also because the detection of them has proved that the factors I have proposed possess some value.

The Gold Industry in Guiana.

I.—THE GUIANA GOLD MINES OF THE PAST.

By James Rodway, F.L.S.

THE large quantity of gold ornaments found by the discoverers of America in possession of the natives, and the treasure obtained by rifling the graves prove not only that there was a considerable traffic in the precious metal, but also that it was more valued than is generally supposed. Although an ounce of gold dust might be exchanged for a common hawk's bell, it does not follow that the gold was not valuable, but simply that the bell was the greater novelty and therefore most coveted. From the Mississippi in the North, to the Amazon in the South, similar patterns of ornaments were commonly obtained, and the evidence is favourable to the opinion that they were derived from the same source. As among most of the tribes the chieftain was buried in full dress, with all his jewels, there must have been a continuous demand for gold and pearls, and there is every reason to suppose that the consequent supply came from Guiana.

There is no question that the Caribs of the mainland had communication with their kindred in the islands; the similarity of language is the strongest evidence on this point. Apart from this, however, we find many writers mentioning as a fact that such a traffic as is required by the circumstances was regularly kept up.

The discoverer of America obtained from the inhabitants of Hispaniola some specimens of spear-heads made of a metal which they called *Guanin.* On being assayed in Spain these weapons were found to be composed of a mixture of eighteen parts gold, six silver, and eight copper. The natives reported them as having been brought to the island by black men who had come from the south and south-east.* In the name of this metal we have a possible derivation of the word, Guiana. That COLUMBUS was convinced of the truth of this report is proved by his undertaking his third voyage in search of the *Guanin* country, in the course of which he discovered Trinidad and the mouth of the Orinoco. RALEIGH, speaking of the traffic with the Carribee Islands says :—"From Dominica to the Amazons which is above 250 leagues, all the chief Indians in all parts wear of those plates of Guiana. Undoubtedly those that trade with the Amazons return much gold, which cometh by trade from Guiana, by some branch of a river that falleth from the country into the Amazon."† Gold was brought into the Amazon according to ACUGNA, from the River Curupatuba, which is represented on modern maps as rising in the mountains of French Guiana. The report of the Indians is thus given : —"At the end of six days' voyage up the stream of it, there is a little rivulet, in the sands and banks of which there is a great quantity of gold found below the place where it washes the foot of an indifferently large mountain."‡ Near the same river the natives said they had found a white metal (silver), with which they had formerly made hatchets

* Irving's Life of Columbus. † Discoverie of Guiana.

‡ Relation of the Amazons, 1640.

and knives, but on account of the softness of the metal, which would not keep an edge, it had gone out of use.

Early in the sixteenth century arose the story of El Dorado, the gilded king, who lived far in the interior of Guiana. Every morning he was anointed all over with a kind of balsam, and afterwards gilded with gold dust. How the gold dust was obtained may be seen from the following extract from a Spanish letter:—"Being asked how they got the same gold, they told us they went to a certain down or plain, and pulled or digged up the grass by the roots; which done, they took the earth, putting it in great baskets, which they carried to wash at the river, and that which came in powder they kept for their drunken feasts, and that which was in pieces they wrought into eagles."* From these reports of El Dorado there was something like a rush of the Spaniards to the Orinoco. RALEIGH well describes an encounter with a gold prospecting party of that time. When his party was almost starving they spied four canoes coming down the river. The rowers put on all their strength to catch them, in hopes of getting cassava bread, while the Indian paddlers pulled for the shore, two of the canoes succeeded in getting into a creek, while the others were captured. The Indians having got into the bush, search was made for them, and RALEIGH found, in creeping through the bushes, "an Indian basket hidden, which was the refiner's basket, for he found in it quick-silver, saltpetre, and divers things for the trial of metals, and also the dust of such ore as had been refined."† He heard afterwards from an Indian chief, that there were

* Hakluyt's Voyages. † Discoverie of Guiana.

three Spaniards in one of the canoes which had escaped, one of whom was a refiner, and also that they had a large quantity of ore and gold."

RALEIGH went up the Orinoco as far as the Caroni, and it was near the mouth of that river where his celebrated gold mine was discovered. Speaking of this part of the country he says:—"Every stone that we stooped to pick up, promised either gold or silver by its complexion." Some of the stones having been taken to London gave most astonishing results, the most valuable according to the Comptroller of the Mint being worth £26,900 a ton, while a trial of the dust of the mine gave 8 lbs. 6 oz. of gold to the hundredweight. Although these results are exaggerated, there is no doubt that large quantities of the precious metal were obtained from the country, as long as the Indians were friendly. BERRIO obtained by trading with the natives "gold plates, images of gold, and images of men and divers birds" very curiously wrought, which he sent to Spain to pay for a levy of soldiers. A chief named MOREQUITO is mentioned as having gone to Cumana and Marguerita, with great stores of plates of gold, which he carried to exchange for such other things as he wanted in his own country.

When the Indians found that the Spaniards wanted to make slaves of them, they began to keep secret the locality of the mines, and did everything to prevent prospecting in their territories. How the natives were made to work may be seen in an old engraving in GOTTFRIED'S "Reisen." On a raised platform is seated the Captain in full dress, attended by a guard of soldiers, while the Indians are engaged in bringing the gold earth in baskets, and water in large earthen jars, washing out

the metal under surveillance, and subject to being pricked with a sword now and then if they showed any signs of objecting. As a natural result of this treatment "the kings and lords of all the borders and of Guiana had decreed, that none of them should trade with any Christians for gold, because the same would be their own overthrow, and that for the love of gold the Christians meant to conquer and dispossess them of all together."* Here we have the true reason, why the gold mines of Guiana were concealed from Europeans for over two hundred years, so that RALEIGH'S evidence was even discredited, and his book classed with travellers' tales. According to HUME:—" RALEIGH'S account of his first voyage to Guiana, proves him to have been a man capable of the most extravagant credulity or most impudent imposture." This opinion of the great historian hardly requires refuting in Guiana. Allowing for a little exaggeration, and taking away what he gives as reports, almost every sentence glows with truthful accuracy. Some of the Puruni diggers will understand the following characteristic specimens:—" For when the springs began to break, and the rivers to raise themselves so suddenly, as by no means we could abide the digging of any mine, especially for that the richest are defended with rocks of hard stone, which we call the white spar, and that it required both time, men, and instruments fit for such a work, &c." —" And it shall be requisite for any man that passeth it (the river Orinoco) to have a pilot, for it is four five and six miles over in many places, and twenty miles in other places, with wonderful eddies, and strong currents, many great

* Raleigh's Discoverie of Guiana.

islands and divers shoals, and many dangerous rocks, as we were sometimes in great peril of drowning."

During the seventeenth and eighteenth centuries hardly anything was done towards exploring the interior of Guiana. The many disasters of the gold seekers appear to have had a disheartening effect on the early settlers. The authorities even went so far as to prohibit gold hunting, as may he seen from BANCROFT'S assertion. "The Dutch are sensible the wealth of America has impoverished and depopulated the once powerful monarchy of Spain, and have, therefore, wisely prohibited the working of mines within their territory of Guiana."* Mrs. APHRA BEHN gives a graphic account of a gold fever in Surinam about 1667 which also goes to prove the disinclination of the government of that day to allow prospecting. She says:—"We met some Indians of strange aspects; that is of a larger size, and other sort of features, than those of our Country. Our Indian Slaves, that row'd us, ask'd 'em some questions; but they could not understand us, but shew'd us a long cotton string, with several knots on it, and told us, they had been coming from the mountains so many moons as there were knots: they were habited in skins of strange Beasts, and brought along with 'em Bags of Gold Dust; which as well as they could give us to understand, came streaming in little small Channels down the High Mountains, when the Rains fell; and offer'd to be the Convoy to any body, or persons, that would go to the mountains. We carry'd these men up to Parham, where they were kept till the Lord-Governor came: And because all the Country was mad to be going on this

* Essay on the Natural History of Guiana, 1769.

Golden Adventure, the Governor, by his Letters, commanded (for they sent some of the Gold to him) that a Guard should be set at the mouth of the River, and prohibited all People from going up that River, it conducting to those Mountains of Gold."*

The Dutch, however, do not appear to have always enforced the prohibition of mining, as in the year 1719, the authorities of Berbice contracted with SIMON ABRAHAMS, a Jew, to search for gold and silver, of which he was to have a sixteenth share. It appears that he found gold, but not in paying quantities, therefore the speculation was abandoned and ABRAHAMS returned to Holland in 1724. The Jews appear to have been the principal goldsmiths in the seventeenth century, and played an important part in the gold expeditions of the time. It is probable that the persons mentioned in the following despatch of CHARLES II. to Lord WILLOUGHBY in 1665, may have heen employed in prospecting in Surinam :—" Whereas certain Jews, under pretence of ability to discover and improve a gold mine in the West Indies, have fraudulently induced His Majesty to make them free denizens of England, with power to trade everywhere,—it is His Majesty's pleasure that their patents of denization be esteemed void, that they make good stranger's customs for all the gold wherein they have traded to Barbados, and then be banished thence. The names of the Jews in Barbados are, ISAAC ISRAEL DE PISO, AARON ISRAEL DE PISO, with his two sisters and two brethren, MOSES and his mother, sent thither by ABRAHAM COHEN. And, whereas His Majesty for

* Oroonoko, about 1670.

their encouragement, bestowed a gold chain upon one of them named ISAAC ISRAEL DE PISO, His Majesty's pleasure is that it be taken from him and returned to His Majesty."* Lord WILLOUGHBY being the Governor of Barbados and Lord Proprietor of Surinam, with a grant of "all Manner of Mynes of Gold and Silver as well not opened as opened" would naturally have sent experts to Guiana. As, however, the king took a fifth part of all precious metals as a royalty, it is probable that the prospectors worked quietly, which accounts for there being no record of gold mining while Surinam was in the possession of the English.

In the early part of the eighteenth century several attempts at gold mining were made in the Colony of Essequebo. "In 1721 the Council of Ten in Holland, granted a privilege, whereby it was enacted that all persons disposed to work mines in Guiana might do so upon certain conditions, and Mr. HILDEBRAND, a miner, was sent from Holland for that purpose. A shaft was sunk at a short distance from the first cataracts in the Cuyuni, but the small quantity of ore found did not repay the expenses of working it, and the attempt was abandoned."† There are also traditions of gold mines in the Groote creek and at Saxicalli on the Essequebo, silver at Caytan on the Cuyuni, and copper on the last named river. If these three metals should be found within the same districts, it will go to confirm the report of the natives of Hispaniola concerning the metal Guanin.

* Calendar of State Papers—Colonial.

† Schomburgk's Life of Raleigh in Re-print of the Discoverie of Guiana.

About the year 1849, Dr. PLASSARD re-discovered gold in the district where RALEIGH placed his mine. After exploring the mouth of the Caroni as far as the cataracts, RALEIGH went back to the Indian town where TOPIAWARI was chief, which is supposed to be the present Las Tablas. Here he was told that the nearest town of the Epuremei nation was Macareguarai, four days' journey from TOPIAWARI'S town. From the Epuremei came all the gold plates that "were scattered among the borderers, and carried to other nations far and near." New Providence, which is the centre of the present gold diggings, is just about four days' journey from Las Tablas, it is almost a certainty therefore, that the original manufacturers of the gold plates lived on the Upper Cuyuni and Yuruari. Fragments of pottery, stone axes, an old mortar, and the remains of mining shafts, have been found by the diggers in the Caratal district.

For some years after Dr. PLASSARD'S discovery of gold at Tupuquen nothing was done towards working the mines. At last, however, about 1857, numbers of people began to flock to the district and commenced washing the sands of the Yuruari. Afterwards pits were dug on the side of the river, and quartz crushed in wooden mortars with iron pestles. There are now several mining companies at work crushing the quartz, which is very rich, although there is nothing to equal RALEIGH'S £26,900 the ton. The largest nugget hitherto obtained weighed 180 ozs. this was got by washing what is called the *Tierra de flor*, found at about eight feet below the surface under a stratum of gravel and pebbles, having been probably the old river-bed.

Among the people that took part in the first rush to Tupuquen were several persons from Demerara. In returning by way of the Cuyuni a party gathered some of the sand of that river, thinking it looked like that of the Yuruari. On its being examined in Georgetown it was found to be decidedly auriferous. This discovery having been made public, several gentlemen from Georgetown made up a prospecting party for the Cuyuni where they found auriferous quartz. On their report a Gold Mining Company was formed, machinery imported, and considerable expense incurred in cutting a path alongside the river, to avoid the cataracts. Before the "Company" had started, the proprietors applied to the Colonial Government for a grant of land, which they obtained. On account of the Boundary Dispute, however, the grant was revoked, the shareholders became dissatisfied, and as the quantity of gold obtained was hardly an ounce to the ton, the project was abandoned, and the machinery allowed to go to ruin.

Nothing more was heard of gold-digging in British Guiana until about 1882, when it was rumoured that prospecting was being carried on in several rivers of the colony. Since that time the precious metal has been found in nearly all the great rivers of British Guiana, seeming to indicate that there is an auriferous belt extending across the country, into Dutch Guiana, where gold was found in the Surinam River in 1876-78, and in the Saramacca in 1879. As long ago as 1864, gold-washing commenced in French Guiana, on the River Mana, and last year (1886) two companies commenced quartz-crushing in that district.

The question is being continually asked in Demerara ;

will the Colony be benefited by Gold Mining? PALGRAVE, writing on Dutch Guiana in 1876, expresses a strong opinion against any expected good from it in that Colony, and his words apply with equal force to the British Colony. "Some say, there is hope of mines to be discovered among the mountain ranges in the far south of the Guiana territory; and on mines what may not follow? Little good, I fear. Long since the world-wide wisdom of "large-browed Verulam" pronounced the sentence, ratified by a world-wide experience, that "the hope of mines is very uncertain, and useth to make the planters lazie in other things." Mineral treasures are the veriest Pandora-gifts of nature to a land, and that Surinam may be spared the deadly present is the best wish her friends can make in her behalf. The territory is too narrow to contain at once two masters, the mine and the field; one or other must speedily give way. The true product mines of Surinam are her plantations; they lie above ground, not under."

2.—THE RECENT SEARCH FOR GOLD IN BRITISH GUIANA.

By E. A. V. Abraham.

GOLD, gold everywhere, and not an ounce to spend! Such may be the cry of many a person who has journeyed to the depths of the interior in the growing thirst for gold. Gold is the theme of every one. Each person we meet asks us

whether we are interested in gold ; and perhaps a narrative in regard to the search for the precious metal may not be amiss.

We will start from the beginning ; and after having formed our Company and secured a good prospector, (a most difficult thing nowadays,) we proceed to buy provisions, our boat having in the meantime been ordered. The boat is a stumbling block, and on it everything depends. There are boats, and there are boats ! A run to Bartica will show boats from the tiny woodskin to the mammoth coal barge, all intended for use in the trade, and each thought by the owner to be *the* one *par excellence.* The best boat is the one made on the model of those used by the canal men, but a greater breadth can be obtained, if deemed desirable.

Our boat is on board the contract steamer, and we start for Bartica at 8 a.m. *via* Tuschen stelling. Our passengers are all in high glee, some under the influence of spirits, some with spirits elated at the new life before them, and some calculating with far-seeing eyes the probable find. There are the European enjoying his Havanna, the ever-bustling Yank with his "I guess," the black man glad of a walk, and the stolid Chinese taking in for future consideration the talk that is going on around him.

Tuschen is reached about 9.30 a.m., and more passengers embark. Soon after this we bid good-bye to Demerara ; and our eyes, so long accustomed to its muddy waters, are gladdened by the bright sparkling cascades formed at the bow of our vessel as she cuts her way through the dark waters of the Essequebo. After awhile the blue mountains loom in sight, and we expect soon to see their

sides, but are doomed to disappointment inasmuch as the more we approach, the more they seem to recede. The banks of the river and the numberless islets dotting it here and there, are all higher than those to which we have been accustomed; and the rocky appearance that is seen, along with the huge boulders rising majestically above the waters, makes our voyage a pleasant one; and time passes quickly.

Fort Island with its ruined forts and its old Dutch church, and Kyke-over-all, glide by us, and remind us of the past when the Dutch with their accustomed caution placed the capital in this naturally protected and healthy district. Other islands pass us, and we arrive in sight of the pretty little church, perched about 100 feet above the water's edge, at Dally. The children are at school, but they rush out clapping their hands and shouting in innocent glee at the steamer as she passes them, while the master fires a gun as a token of joy. Dally quarry is next seen; and from a sheltered cove the hospitable Mr. MATTHEWS, the owner of the quarry, glides out in his boat and gives race to the steamer, meeting her at Bartica, and inviting friends to visit him.

We arrive at Bartica about 3 p.m.; all the way up, there were no signs of animal life, and it was only here and there, en route, that a boat lay waiting for a parcel or letter. The steamer does not stop at Bartica, but at a red buoy higher up, and there disembarks goods and passengers, before proceeding for the Settlement further on. Then there is a bustle and a jumble, shouting and pushing, as each man strives to be the first out. The only wonder to a bystander is that more accidents have

not occurred. We get our goods into a shore boat, and pull for Bartica. A drizzle is on : one of those weird things that DORE loved to picture—a mist, yet of such a nature that one can see through it a broad sheet of water, high land, canoes, boats, &c. on the water, with their forms seen reflected far down as reflections can be seen only in the Essequebo. Above all is a brilliant rainbow; beyond, the Grove; behind, the castle-like Penal Settlement. Surely these sum up a picture that makes the blood course in heated race! Such is our feeling as bountiful nature appears so wonderful, so grand, so beautiful, and so impressive.

We land at the Grove and put up at one of the hotels, where we find the cuisine if not as good as we get in our own homes, yet palatable and cleanly served. There is not much time for viewing the Grove, and we turn in to bed. We sleep soundly and heavily, and are awakened by one of the neighbours, for up here we drop the *hauteur de rigueur* for the hail-fellow well-met. Drinks are given and taken with those one would not mix with in one's club. We are only gold-diggers when in the bush, yea more than mere diggers, we are neighbours in every sense of the word, helping each other and tending each other, knowing that each is a man and a brother, and that when stricken with fever, or other illness, each is helped by the other.

Not having engaged our boat hands, we next morning look about. Here comes a poser! How are we to get on without a captain? There are several who offer their services as captains or bowmen, but we do not take them: some are Indians who *do not know* how to take a boat over the falls; and the majority, merely pullers

who are profiting by the dearth of captains and the abundance of boats. The captains are well known and can easily be got by arrangement before hand. The captain engages his bowman, for as the former is responsible for the journey up, so is the latter for the way down. We engage the pullers. The captain is rather dubious about the safe conduct of the party. He is accustomed to a boat not more than 31 feet long, here we give him a boat 36 feet long ; this extra 5 feet is a source of anxiety to him. Again, our boat has a sheer fore and aft; he knows to his own cost that the sheer is too much ; but he promises to do his best. We load the boat, get in, and put away with anxious fears as to our journey.

At Cartabo we make a halt, and those who have a taste for hog-plums can have their feed from the thousand and one scattered on the ground. Here is an old lady, a nurse of the THIERENS; she is glad to see us and treats us to a dance. She shows us a tankard from which governors, and other bye-gone heroes, have quaffed the river waters. At the foot of her staircase is a granite slab recording the death of one of her sons, who was for many years *the* captain on the river. We bid her adieu, and start for the journey in right earnest.

The boviander pullers make the boat spin, for the sooner they get up and down the more money they earn. Soon is heard the roar of the falls, and we near the seething water. The cry is passed from mouth to mouth "Oh! Marshal* boy, we is coming for you!" A halt is made, and one puller asks the other "Marshal

* The name of the falls.

look bex to-day, eh?" "Yes, man, she is too bex!" The bowman turns to the captain, "Captain, she is bex for true!" "Let she walk!" returns the captain. This is done at all the big falls. Before one is aware of it, there is a splash in the water, and the cause is a local Captain Webb who has plunged, or rather has dived, into the water, rope in mouth. He gets a foothold on one of the rocks, and rises, shaking the water from his head, and then makes taut the rope. "Overboard!" yells the captain, and out goes every man but himself from the boat.

Steadily the boat is hauled over the foaming mass of water, the captain yelling out his instructions, the bowman holding on like grim death to the bow, and keeping the head free from the numerous rocks which would break her should she touch them. The scene is an exciting one. No man thinks then of danger to himself, it is "God for us all and the devil take the hindermost!" The craft is now in safe water, and in we get, pulling again as if nothing had happened. The dull thud of the paddles, and now and then a song, are the only sounds we hear.

Soon, round a bend of the river comes a steady, spirited chorus, and as we shoot round we see a boat coming down with the hands. We do not know them, but we stop, exchange greetings, drink success, &c., and wish God-speed.

We make a halt for the day. The captain and bowman jump out, and expect to do no work, unless otherwise arranged beforehand. The other men sling hammocks, and those who were wise enough to take up a small tarpaulin, cut sticks and put up an improvised tent tied with bush

rope; and master and servant sleep next each other, a fire being kept up all night. Next morning "tea" is served out, and the hammocks taken down; and we start afresh, only halting for breakfast and for the night—generally at the foot of some falls.

We eventually arrive at our destination, and with hearts gladdened that all is safe, proceed to build a benab. Next morning we go prospecting, armed with a day's provisions, a gun, cutlass, shovel, battel, and a little grog. A prospect hole is dug, and after the gravel is passed, a couple of shovels of earth is put inside the battel; this is then placed in the water and tumbled round like a whipping-top. The dirt is thrown out by the whirling motion, and a little black sand is all that remains. A couple of drops of water is thrown on this, and a few specks of gold are seen. This does not pay, and we go on prospecting, following the winding of the creek until we reach a spot which is likely to pay. This is marked out, and we return to our camp. Next morning we strike, and every man takes his quota of luggage ranging from 25 to 50 lbs. according to the distance to be travelled. The luggage is put in canvas (painted) waterproofs bags, and is taken on the shoulder, or with a strap made of the bark of a tree. The transportation is no easy job when one has to climb up a hill and down another, and to cross a creek on a tacooba,* overgrown with moss, and become slippery.

Here we are at last on our El Dorado! A benab properly partitioned is put up, a room for the master or manager, one for the men, and one for provisions and stores. The men are set to cut down the trees for a space of

* The trunk of a dead tree.

50 yards, so that our camp may get a little sunlight and be out of danger from falling trees. A fire-place and kitchen, *à la Hindu*, are rigged up, and we prepare to work. One of the hands is a carpenter, and he proceeds to make our tom, the machine generally used in this colony for gold washing. Everything being prepared, we at last begin actual operations.

Generally an overseer, or clerk in a dry-goods store, or other person of that ilk, is sent up as manager. Now this manager, possibly, has never seen gold except in the form of jewellery or sovereigns, and he imagines that it is the easiest thing in the world to watch the prospector or the foreman. The foreman never pays his employer in kind, and there have been numerous instances where the trip has cost 1,000 per cent. more in outlay than in revenue. The easiest way for him is to barter his provisions with his more successful neighbour, for gold; he then hies to town with a couple of pounds of gold, and is sent up again as a good man.

The manager watches and directs the labourers; the foreman watches the manager. A nugget of some value is thrown up in the pay-dirt, and the foreman picks it out and throws it away as a bit of "rockstone"; the manager looks at it and only sees what he thinks is rock, never dreaming for an instant that it is a nugget. The foreman picks it up after the day's work and laughs at the manager's credulity. Again, he washes the battel, and looks the manager steadily in the face and tilts his battel over. The amalgam runs out and lodges in the shallow creek, and the foreman hoists his battel and shows no return. Next morning, or perhaps the

same evening, he picks up the amalgam and again laughs at the manager. These and sundry other tricks go on, and the opinion is that gold does not pay.

Since January, 1887, the Government charge a royalty on gold under rules laid down, at 5°/₀, but in nearly all cases 7°/₀ is taken; and the chance of smuggling is reduced. Still, for all this, gold is smuggled, and finds its way to town by various means of transit.

Generally after three months the party packs up and starts for town; and here, as in our case, the fun begins. To one who can drink deep of nature's draught, it is a glorious life: the thrilling excitement of shooting the rapids, the glorious uncertainty of going over the falls, all tend to cause forgetfulness of self.

The falls are in sight! The boat nears them! Captain and bowman are on the alert. Instructions are given by the captain, and the lives of all are in the hands of the bowman. One second of indecision, one second of uncertainty, and in a moment all is over. The bowman kneels or stands in the bow, the captain standing or kneeling also. The boat touches the top of the falls; all hands pull the paddles for dear life. The boat seems as though it must strike on a rock! Our hearts jump to our mouths! The bowman gives a turn of his wrist and rushes us safely past the rock; and we breathe freely again, awaiting our destiny at the next falls. Should the boat strike at all, it is shivered; and the safest plan then for the occupants is to dive, for the water below is comparatively smooth. Sometimes, from such accidents, it happens that one man is left alone on a rock in the middle of the falls, and he has to stand his chance of being picked up, or of swimming for it.

After a safe arrival at Bartica, the gold is weighed, the royalty marked, and a receipt given; and on arrival in Georgetown we pay our dues and get our gold. And so the search ends!

Several companies have started since January, 1887, with varying success. Some of them have *nil* as a revenue, but go on hoping to hit on a lucky spot. Some have prospered; but, as in other industries, they have only profited by the failure of others. It is no unusual thing for a prospector to jump a claim: indeed, it is considered a smart thing to do so; and the world looks on the jumper as a clever man.

The gold exported during the first six months of 1887, amounted to 4,991 ozs. 13 dwt. 17 grs. as against an annual export of 6,518$\frac{3}{40}$ ozs. for 1886, and 939$\frac{3}{4}$ ozs. for 1885. The number of labourers registered up to the end of June amounted to 1,954.

The industry has suddenly been developed at no inopportune moment, when sugar is down, wages at a nominal figure, and work scarce. There are numbers of men ready to risk life and health for money; and it is a matter for congratulation that the number of men, who have received advances without going to the diggings, is very small. Boat-builders, overseers, clerks and labourers have need to be thankful for the fever.

The health of the men in the gold districts, is good. There are instances where men, who started strong and robust, have returned to town shattered and useless, a burden to themselves, their friends and relatives; but when we look closely into the matter, what do we find? That men, who are accustomed to beds and luxuries, content themselves, in the bush, with sleeping in hammocks a few

feet over the earth, reeking with humidity, and that they turn out next morning without a bath because it is too cold. Again, these men do not consider the change of diet and water ; but think that because they are strong physically, they are strong constitutionally ; and they rush into danger with their eyes open. On the other hand, there are men who do not look as if they could stand a good day's work, and yet, by taking care of themselves, they come back all the better for their trip.

The huntsman, who accompanies an expedition to the gold diggings, provides game and fresh fish,—agreeable changes from the usual salted food ; and one can live comfortably.

Work begins at 8 o'clock in the morning; and at 12 o'clock an hour is allowed for breakfast. At 4 o'clock work is struck, except the washing down of the tom and the spinning of the battel. Some men wash away their gold, some throw it away. One prospector, who has no water at hand, takes his pay-dirt in bags some miles to the water's edge ; and, notwithstanding this, it pays him handsomely. It only requires a knowledge of the work in order to succeed ; and it is with pleasure we see experts from England and California going up to our diggings.

A steamer runs thrice a week to Bartica Grove. A couple of hotels and taverns, a rum shop, a few houses, a church and a town in prospective, make up Bartica. Further up is the house of the Resident Magistrate, and near by is H. M. Penal Settlement, a castellated and pretty fortress, where the click, click of the hammer, and the boom of the blasting, are incessantly heard. Here, a hospital is ready to receive the sick and incapable ; and milk and other luxuries can be procured.

The Legislature since January, 1887, has made several rules and regulations for gold mining, and, as a consequence, several disputes have arisen among the placer-holders: a few legal proceedings have been the happy outcome.

A few diamonds have been found; and it is likely that, when the new town of Bartica is finished, and the question of the disputed territory settled, British Guiana will have cause to bless Sir WALTER RALEIGH for his El Dorado.

The Natural History of the Animalcules.

By the Editor.

THE question naturally arises at the very threshold, "what are Animalcules?" and many very practical natures, to whom the *cui bono* is the beginning and the end, without waiting for an answer which might throw some light upon the question, will doubtless pass at once from the simple "what are they?" to the uncompromising "of what good are they?" with the evident desire that the justification of the subject itself on the ground of utility should be stated, as a first and necessary preliminary to their attention and interest.

At the outset it must be pointed out that, in an essentially popular account of these organisms, only partial and inadequate answers can be given to these two questions, since their wide bearing and importance would only be evidenced as the Animalcules themselves passed in review, and yielded the knowledge necessary for the thorough comprehension of their structure and life history.

In a strict use of the term, Animalcules should refer only to the most minute members of the animal kingdom—to those, in fact, which are, or almost are, beyond the reach of ordinary vision, and which, as a rule, require a magnifying-glass or microscope for their detection. A microscope is in every case necessary for the study of their structure; and while by this means many are known

to be of the simplest structure imaginable, destitute of any kind of organisation, presenting the aspect simply of minute specks of a jelly-like substance comparable to the albumen or unboiled white of an egg, a substance known as "sarcode" or "protoplasm," the "physical basis of life;" yet, on the other hand, many, in comparison with these, possess a high degree of organisation, which, however, in comparison with that of the higher animals such as the beasts, birds, reptiles or fishes, or even the insects or worms, can only be considered as of a very rudimentary kind.

The basis or ground substance of life, this protoplasm, is in every case the same, and is most easily perceived at the beginning of the life of the minute animal, when its character has not yet been interfered with by growth—a condition that is as absolutely characteristic of all other animals, whether highly organised or not.

The absence or simplicity of organisation in the Animalcules is noteworthy. In the higher forms of animal life, we are familiar with a complicated apparatus, or body, made up of an internal supporting tissue, or skeleton; of a sensory or nervous tissue for sensation, with its brain, column and branching nerves; of a muscular system for motion, in intimate relation with the skeleton and nerve tissue; of a circulatory or blood system, with its central heart, and its ramification of vessels, large and small, carrying nutriment to every portion of the body; of a respiratory or breathing system, aerating the blood or nutrient fluid, and, aided by secretory and excretory organs, keeping it pure and wholesome; of a digestive system, providing for the manufacture of this blood or nutrient fluid; and of a

generative system to ensure the propagation of the specific form: all equally elaborate, interdependent and wonderful. In the Animalcules we find an entire absence of each and all of these systems. A "body" is certainly present, consisting in the lowest forms of a minute speck of simple outline, and in the higher forms taking on a complicated and often thickened outline, more or less supported by an external covering or shell, functionally a skeleton; but, in all, the interior consists either simply of the jelly-like protoplasm, or of protoplasm variously thickened by oily globules or granules, or marked by fluid spaces, or more particularly by a denser, jelly-like mass known as the *nucleus*.

In a few forms, a simple aperture or mouth, leading by a simple canal or gullet into the soft, central, jelly-substance of the body, represents the beginning of a digestive tract; but usually food is taken in, and refuse thrown out, at any part. In some others, a small globule of liquid which forms and bursts rhythmically, represents some very rudimentary type of a circulatory or excretory organ; while, in still fewer forms which are stalked, the stalk contains a contractile fibre which may be taken to represent a rudimentary muscular fibre. Sensation takes place by the general margin of the protoplasm or by variable and temporary extensions of its substance, or by fine, hair-like or whip-like threads which are permanent extensions of the body, and these serve also as locomotor and prehensile organs, taking the place of arms and legs, seizing food when it is at hand, causing currents in the water in which the organism lives, so that food is brought within reach, and giving rise to moments for progression. No sexes can be distinguished among these minute beings;

and, in spite of numerous statements to the contrary by numerous observers, the only certain methods of multiplication known are those which depend on portions of the body substance being detached or on the body itself splitting up into two or more pieces, each of which grows to the size of the form from which it was developed, and in turn repeats the processes of fission.

Though the Animalcules are destitute of all the various complicated systems and tissues which are present in the higher animals, and though all their essential features of organisation are so extremely simple, yet their vital processes of growth and reproduction are performed with the utmost degree of perfection; and the simple speck of protoplasm fulfils the various functions of sensation, muscular activity, and nutrition, as adapted to the struggle for existence in its surroundings, as completely as the complicated apparatus of the highest forms.

It will thus be understood that though minuteness of size is the prominent idea to be conveyed by the term Animalcule, yet simplicity of structure is almost equally characteristic, so that the two features may be looked upon as correlative. And just as, with regard to organisation, there is a marked degree of variation among the different kinds of Animalcules, so also, as regards minuteness of size, is there the same degree of variation. For while, on the one hand, there are forms which are visible to the naked eye, some of which indeed attain to a size of more than half an inch in diameter, on the other hand, there are others which, after being magnified several millions of times, are but barely discernible under the microscope—organisms of such minute dimensions as to make it impossible for the mind to picture them. Between

these two extremes, Animalcules of all sizes may be met with, each kind being limited within a certain range of growth, as constant in these lowly organisms, measured by their humble fractions of an inch, as it is in the lordly beasts, measured by their yards and feet.

It has already been stated that, in the strict sense of the term, Animalcules should only include the most minute members of the animal kingdom, and we have incidentally seen that these are also the most simple in structure. Among the older naturalists, however, the term had a much wider application, for it included not only a very large number of minute, highly-organised forms, such as allies of the worms, crabs, shell-fish, etc., but also a very large number of minute *plants*. With the gradual perfection of the microscope within the last fifty years, the highly organised minute animals have been weeded out from the Animalcules, and have been placed among their allied larger forms; and a very large number of vegetable organisms have shared the same fate.

Considerable difficulty exists, however, in satisfactorily dealing with the separation of the minute animal and plant forms, for there are many types of life which, in certain stages of their existence, so closely resemble undoubted animal types that they seem referable to the animal kingdom, and which, in other stages, from their resemblances to undoubted vegetable forms, seem referable to the vegetable kingdom. So much, indeed, was this difficulty felt that, a few years ago, it was seriously proposed that a kingdom should be formed, intermediate between the animal and vegetable kingdoms, for the reception of all those doubtful organisms which seemed both plants and animals.

The causes of this difficulty, moreover, are easily seen, when we bear in mind that while, on the one hand, in the higher plants and animals there are certain characteristics, such as form, presence or absence of a digestive apparatus, power of motion, etc., which will serve easily to distinguish the animal from the plant, on the other hand, in the lowest types no corresponding differences in these characteristics prevail, the form of the lowest plants and animals being often identical, and the absence of a digestive apparatus and the power of motion being features equally marked in both groups.

More than this, the green colouring matter or *chlorophyll*, so characteristic of the generality of plants, is quite absent from the great group of the Fungous plants such as the moulds and mushrooms—a group, moreover, that furnishes a very large proportion of forms allied to those in the debatable land; while this colouring matter is present is many undoubted animal organisms such as the Fresh-water polypes, the Trumpet-animalcule, etc. Again, the substance *cellulose* that presents such a marked feature in the life of plants, forming the outer layer or covering of the ultimate units or *cells* of which the plant is composed, is yet absent from many of the lowest plants during a great portion of their existence, and must thus be regarded as not being an essential to plant organisation, though highly characteristic of it; while, among a great group of highly organised animals known as Ascidians or Sea-squirts, this same cellulose is present in their outer covering or test, and must thus be regarded as a possible, though by no means characteristic, feature of animal organisation. And again, while plants are able to build up, and store away in their various parts,

highly complex compounds manufactured from simple inorganic materials supplied to them as food—a characteristic not possessed by animals, which require complex organic compounds for their nourishment—yet very many plants, and chiefly those of the great group of the Fungous plants, are unable to assimilate inorganic food, and are as dependent as animals on organic products.

An important factor in the difficulty of distinguishing the lowest plants and animals, is to be found in the conditions under which they must be examined, which, in conjunction with the very minute size of the organisms, render it extremely difficult, or even impossible, to apply tests and perform experiments, which, under ordinary circumstances, would be practicable and decisive.

Considering the fundamental distinctions which were once thought to underlie plant and animal life, it was natural that the basis or ground substance of life, the protoplasm, should be considered essentially different in the two kingdoms; within the last thirty years, however, it has been shown that no such difference exists, but that protoplasm is essentially the same both in plants and animals.

The intimate structures of plants and animals are also essentially the same: they are all made up of, or derived from, morphological units, known as *cells*. The cells, which are always minute, generally consist, in plants, of portions of protoplasm surrounded with a covering of cellulose; but, as we have seen, this coat of cellulose is absent in many humble plants; and the essential component of a cell is, therefore, simply the protoplasm itself. In animals, the cell also presents itself in the form of a speck of protoplasm, though usually it is

surrounded with a thin coat or cuticular layer quite different from cellulose.

The lowest forms of plants and animals, and necessarily those of doubtful position, consist simply of a *single* cell, which may be of very diverse form caused either by arm-like or hair-like extensions of its protoplasm, or by the secretion of a test or shell, generally of calcareous or siliceous matter. As we advance higher in the scale of organisation, we find plants and animals composed of aggregations of cells, the unicellular becoming the multicellular, individual cells being variously modified to form the different vessels, fibres and tissues of the higher organisms, in which, as for instance among animals, we meet with nerve-cells, muscle-cells, bone-cells, reproductive-cells, etc., each modified to perform different functions. In all cases, the complex organisation of the higher form has been derived from a single cell, commonly known as the egg-cell—in other words, all these organisms start life as a single cell, in which temporary stage they are comparable to the permanent stage of the lower forms or Animalcules. In all cases, the reproductive cells are those which are least modified from their original character, and are those alone which ever take on the temporary, primitive stage of an unicellular organism.

From what has been said, it will be seen that the Animalcules are almost invariably unicellular beings; and in the fact that all the complicated apparatus of the higher organisms has been developed from cells comparable to the simple cells of the Animalcules, will be found an explanation of the wonderful condition met with in the lower types, in which the one cell performs,

satisfactorily to itself, the various functions performed by the skeletal, nervous, muscular, circulatory, respiratory, digestive and reproductive systems in the higher forms. The one cell is functionally the exact representative of all these various systems, and, in each individual life among the higher organisms, such a simple cell—but one already potentially differentiated—has given origin to such systems.

It will already have been seen that, from the difficulty that is met with in distinguishing many minute forms which may be plants or animals, it is impossible to limit definitely the extent of the group of the Animalcules, since many of these doubtful forms will probably be ultimately determined to be animals—in fact, many of them are so determined at present by observers or writers of more or less repute, although, generally, a good deal of uncertainty exists in the matter. The indefiniteness that, on this account, attends the application of the term Animalcule, is one, however, that will gradually be lessened, and possibly removed, as the methods of research and the instruments for investigation are more perfected; when, also, the land of the doubtful organisms will be doomed for division between the hostile hosts of the undoubted plants and animals.

The term Animalcule is often restricted to one group of simple organisms in which the surface is more or less covered by those vibratile hair-like or whip-like extensions of the protoplasm, known as *cilia* or *flagella*, by means of which the organism is able to propel itself rapidly through the water in which it lives—a group otherwise known as the *Infusoria*, from the presence of many of its forms in infusions of animal and vege-

table substances. But this is essentially an unwise limitation, since all the minute and simple forms are properly Animalcules—all those, in fact, which, while at the same time minute, possess that simplicity of structure that points to a close or considerable degree of relationship, as compared with the higher forms. By this same principle, the term must be held to be properly exclusive of the group of minute worms or worm-like forms which are popularly called "Wheel-animalcules," and technically *Rotifera*, both names referring to the circular or disc-shaped anterior portion of their body, which portion, being lined with rapidly vibratile *cilia*, gives rise to an apparent, though not real, rotatory motion of the organism through the water. These forms, though minute, possess a high degree of organisation, evidenced by their distinct muscular, nervous, reproductive, digestive and excretory systems, which are of such a kind as to ally them to the groups of the worms and other segmented animals—far removed from the simple organisms with which the older naturalists united them, and with which the only common feature, in the light of modern knowledge, is their similarity of size and motion.

Until quite recently, the Animalcules also included the multitudinous minute beings that were considered to make up the composite body of the sponges—an application of the term that was strictly accurate in the light of the knowledge of that time. Owing to the knowledge that we at present possess as to the constitution of sponges, however, such an application is no longer permissible; for the sponge-body, instead of being a colony of structurally minute, simple beings com-

parable to the Animalcules, consists of a compound body comparable to the Zoophytes, made up of a dense aggregation of buds around a multicellular parent form, in which the cells are arranged in at least two definite layers—an outer sensory, and an inner digestive layer—from the outer of which a nervous system of a simple type is developed. The term, also, must be considered exclusive of the highly-organised, free-swimming, larval stages which are characteristic of many of the higher animals, notably of the worms, molluscs, etc.; while its wide application, in a popular sense, to include undoubted vegetable forms, is so evidently inaccurate that it needs no remark.

Animalcules are found throughout all parts of the globe, in fresh and salt water, and in situations that are more or less permanently moist and washed by water. The sea may be described as their great home, but ponds, pools, lakes, trenches and streams, especially those that are stagnant or contain a large amount of decaying matter, furnish an inexhaustible supply.

So far we have been concerned with the question of the general nature and structure of the Animalcules, pointing out in what way, and for what reasons, the name should be limited or extended from its former and popular signification. From this standpoint it will be of some advantage to pass in quick review a few of the more typical Animalcules; for, in this way, not only shall we become familiarised with models, by means of which we shall be enabled to design accurate pictures of the group, but we shall also obtain some idea of the chief orders or grades into which this multiform assemblage is divided. For this purpose the models will be selected from those

that common and general experience has shown to be the most suitable.

At the very commencement, one form, the Proteus-animalcule, will be selected as a representative of the whole group of the Animalcules; and after the examination of its structure and life history, it will remain as a type before us, while the other forms are reviewed; and we shall be enabled to picture, by an unscientific use of the imagination, the silent pity with which it regards those lower in the scale of organisation, the free and genial recognition which it gives to its compeers, and the doubtful tribute of admiration which it offers to its superiors, as they pass before it.

The Proteus-animalcule is before us! and we are at once struck with the simplicity of structure that meets us, as we gaze at it through the microscope. The first view shews us something that looks very much like a small quantity of liquid spread out on the surface as a thin layer, having a very irregular outline, the marginal part quite clear, while the inner part is crowded with various sorts of granules and particles. This apparent liquid is the thin jelly-like protoplasm. The very next moment, the outline is observed to alter, and if it be carefully watched no difficulty will be met with in interpreting the change that occurs, though this alteration will vary slightly according to the exact kind of Proteus-animalcule that is examined.

In one species, the alteration is seen to consist in the protrusion of a small portion of the fluid substance, and this portion increases until the rest of the fluid substance has, so to speak, run into it. But, meanwhile, other protrusions have been taking place chiefly along the outline

of the first, so that the liquid substance passes not into one protrusion only, but into the several others. By this flowing on of the body substance into the various protrusions, the shape of the organism is constantly altering; and the motion of the whole is determined by the direction in which the protrusions take place—a direction that is constantly changing, to so great an extent as to give the observer the impression that the little organism has not the faintest idea of what it wants to do, vacillating continually as to the direction in which to move, and after having made a start, changing about, here, there and everywhere, in a manner that is quite entertaining, though, to say the least of it, perfectly hap-hazard. Doubtless the Animalcule has a perfectly different explanation to offer of its own case, and if it were capable of observing the movements of the lords of creation, would be able, from its vantage-ground of perfect mobility, to ascribe a very farcical aspect to the locomotion of a jointed body.

In another species, in which the protoplasm is denser, the protrusions have more definite form. When retracted, however, they are entirely absorbed into the general substance, and leave not a trace of their former existence. These temporary protrusions are known technically as *pseudopodia* (or false-feet); and it is owing to the constantly changing form which they occasion, that the organism has received the common name of Proteus-animalcule, and the scientific one of *Amœba*—i.e. changing.

Still gazing closely at the little object, we notice that as it creeps or flows slowly on its way, it comes in contact with various particles, organic and inorganic. A certain selective power is manifested in its treatment of

these particles, for while, as a rule, the inorganic are passed over, the organic particles, which will serve as food, are retained. It is observed also that at whatever part of the body the particles touch, at that part they are received, any and every portion becoming a mouth for the time being, though the aperture closes up directly after—in the same way that these particles, when they have yielded all their food matter, are thrown out from any part whatever of the little body to which they happen to be contiguous, the aperture again closing up as though it had never existed. Towards the central part of the Animalcule, the various particles are found aggregated, and they consist almost entirely of minute vegetable organisms. Among these, and towards the hinder part —hinder, that is, as regards the direction of motion—of the Animalcule, will be noticed at intervals a rounded, glistening object, which increases in size and then suddenly collapses, the fluid of which it was composed escaping and washing out, so to speak, the hinder portion of the organism. It thus appears and disappears at short and regular intervals. This is the body known as the *contractile vesicle* or *vacuole*, believed by some to be a rudimentary circulatory organ or heart, by others to be an excretory organ; though, doubtless, it functions as both. Another small, rounded, clear object, known as the *nucleus*, which is to be found in every *Amœba*, may possibly be noticed; it will readily be seen if a drop of magenta colouring solution be added to the liquid containing the specimen. The whole of the protoplasm becomes stained and the nucleus particularly so, becoming most visible. The functions of the nucleus are not cer-

tainly ascertained, but it seems to be the seat of all reproductive changes.

If continuous observation of the organism be made, it will at times be noticed that a protrusion or pseudopodium becomes detached, and that this becomes by growth another *Amœba*; or that the body divides into two parts, each part growing into a perfect Animalcule; or that the entire organism draws in its pseudopodia, becomes rounded and cyst-like, and remains quiescent for a certain time, in what is called its encysted state, ultimately freeing itself again after its period of rejuvenescence.

The Proteus-animalcule affords a good example of the unicellular organisms. It consists of one small mass of independent protoplasm; and when this divides into two portions, these do not remain attached to each other to form a bi-cellular organism, but separate and lead independent lives. It may be taken as a special type of the class of organisms known as *Rhizopoda* or Root-footed Animalcules—the name being given in allusion to the pseudopodia or false-feet. In this simple type of life, no sense or nervous organs, no digestive organs, no muscular organs, no generative organs are to be found; yet all its vital processes are performed satisfactorily to itself. It lives, it grows, it feels, it moves, it reproduces its like; and the one cell is the seat of all these phenomena, the explanation of which is to be found in the fact that these are, above all, the essential characteristics of protoplasm, that "physical basis of life" of which the cell is composed.

A peculiar interest attaches to this type in the fact that if the blood or nutrient fluid of all the higher animals be examined, it will be found to consist, either in part or

wholly, of a thin liquid in which are contained cells, or corpuscles as they are then termed, comparable to the Proteus-animalcule, in which, however, no contractile vesicles have yet been discovered. These corpuscles—white-corpuscles they are termed in contradistinction to coloured corpuscles, also found in the blood of back-boned animals —possess a nucleus, and the pseudopodial movement so characteristic of *Amœba*, a movement in fact that has taken its name "amœboid movement" from that type. In the blood of man, the coloured corpuscles which give the characteristic red colour, are much more numerous than the white corpuscles, and unless care be exercised when blood is examined under the microscope, only the coloured corpuscles will be noticed.

Amœbæ are to be found in stagnant water, in mud or even in moist earth. Unlike most Animalcules, they are not to be found free-swimming in the water, but creeping on the sides or bottom, attached to mud or decaying matter, in which they will frequently be observed when a little of this matter is gently scraped off and mounted for the microscope.

Having now a fairly accurate idea of the structure of this type, we will briefly review a few other forms of the Animalcules, a very large number of which are known to possess a still more simple structure.

Thus one form, which may be termed the Lower-amœba (*Protamœba*), differs in being destitute of a nucleus and a contractile vesicle, though similar in every other respect: its amœboid movement, its changes of form and its method of feeding, are of the same kind as those of the Proteus-animalcule. This form thus presents the aspect of a single speck of protoplasm without specialised

structure of any kind whatever—being indeed one of the most primitive of the forms of life. To Animalcules of this kind, composed of utterly structureless protoplasm, the group name of *Monera* is applied, in allusion to their singleness of composition.

The next form, which may be termed the Vampire-animalcule *(Vampyrella)*, is also destitute of a nucleus and contractile vesicle, but its pseudopodia or false-feet, instead of being thick and blunt, are fine and hair-like, or filamentous, protrusions of the protoplasm; and when these filamentous pseudopodia are retracted, like the ordinary form they become mixed up with, or absorbed by, the ordinary protoplasm of the body, in which they are quite indistinguishable. These Vampire-animalcules are peculiar in the fact that they frequent the neighbourhood of certain minute plants, and feed upon them by attaching themselves to the cells of the plants by their pseudopodia, and then sucking out, or abstracting, the contents of the cells.

We notice next a very striking type of organisation, one that we may distinguish as the Reticulate-animalcule. In this form, a nucleus and contractile vesicle are present as in the Proteus-animalcule, but the pseudopodia instead of being short, thick and blunt, are filamentous and very protrusible, and interlace repeatedly to form a netted structure which has been compared to an "animated spider's web," an apt comparison, since this network serves to ensnare food for the Animalcule. A minute shell, composed of lime, surrounds the body of the cell, and this shell is pierced with minute holes, so as to give passage to the pseudopodia. This calcareous shell may be like porcelain or like glass; and, according to the

kind of reticulate Animalcule observed, may consist of one chamber or of several. When there are several chambers, they are generally arranged either in a line, like a row of beads, or in a spiral, like the coils of the shell of a nautilus or snail. In many reticulate Animalcules, no distinct shell is to be found, but the organism forms a covering composed of cemented foreign matter, like sand grains, sponge spicules, &c. It must be particularly noticed, however, that though the shell may be composed of many chambers, and the chambers filled with the protoplasmic substance, yet the whole consists of one cell. The body substance is constricted, but not entirely divided off so as to form independent parts; the whole consists of an original cell, around which several partial buds have developed, which are not distinct from, but are intimate parts of, this cell. Owing to the minute holes or *foramina* which generally pierce the shell in all directions, these reticulate Animalcules are classed together as the *Foraminifera.* They are, almost without exception, marine organisms; and, though found plentifully in the deep sea, are essentially characteristic of the surface layers of the tropical seas and oceans. In such areas one form, technically known as *Globigerina*, is extremely abundant. In this form the shell is spiral, like an ordinary snail's shell, and each coil of the spiral consists of four chambers. The *Foraminifera* vary considerably in size: some are perfectly microscopic, while others have a diameter of about half-an-inch. These latter are some of the largest of the Animalcules.

We notice next another type that is equally striking —a type to which the term Radiate-animalcule may be

applied, owing to the fact that the pseudopodia are in the form of radiating threads. They possess a shell or skeleton, but this is composed, not of lime as in the reticulate Animalcules, but of flinty or siliceous matter; while radiating siliceous spines are very characteristic of the group. The various members of the group differ considerably from each other—an extreme point being reached in those organisms in which a simple form becomes composite or multicellular. In these latter, however, there is no differentiation in function, there being no difference in position among the cells : each one cell performs the same functions as every other cell, unlike the case of the higher organisms where the various cells, differing in position, perform different functions according to their position. These radiate Animalcules are included under the group name of *Radiolaria.* They are generally microscopic, but the composite forms grow to more than half-an-inch in diameter. They are, with few exceptions, marine forms, abounding in the surface waters, though also common in the deep sea. A large, freshwater group, called Sun-animalcules from their typically radiate pseudopodia, are generally separated from the other *Radiolaria.*

The next and last type that presents itself for our notice, is one to which the highest place as regards organisation must be given. This type belongs to a group to which reference has already been made, viz. the *Infusoria.* In these we lose sight altogether of the temporary protrusions of protoplasm, the pseudopodia, which are so characteristic of the other Animalcules—here the processes of the protoplasm are permanent. They take the form either of minute, rapidly vibratile

hairs, when they are termed *cilia* ; or of long whip-like threads, known as *flagella* ; or again of small threads terminated by *suckers ;* and the various organisms are termed accordingly as Ciliate, Flagellate and Suctorial *Infusoria.* By means of these processes the organisms move rapidly through the water, either steadily by means of cilia, or plunging along by means of the flagella ; and these same processes serve to procure food. In the ciliate and suctorial forms, the processes are always very numerous; in the flagellate forms, usually only one flagellum is present, and this has given rise to the term *monad*, applied to such forms. In all these forms, the outer part of the body consists of a layer which is firm and dense as compared with the central soft substance of the cell, and the cilia and flagella are processes of this firmer layer. Except in the parasitic, suctorial forms, a distinct mouth is present, and a short gullet leads into the soft central protoplasm—structures that present the rudiments of a digestive tract. Rudiments of muscular structures are also present, seen most clearly in the contractile, stalked forms. A large nucleus, and one contractile vesicle, or several, are also present ; but there is no shell or skeleton. The particles of food-matter taken into the soft central mass are surrounded with minute drops of water taken in with them, and these give the appearance of being minute stomachs, and as such, indeed, they were considered by the old writers. Reproduction takes place certainly by budding and by fission, with or without conjugation or encystation ; and although several other processes have been described, they have been more or less discredited by recent research. A very remarkable feature is to be found in the fact that the minute germs of many monads

have been heated above the boiling-point of water, and yet have survived. The *Infusoria* are very widely distributed, being found everywhere in fresh or salt water, especially where decaying matter is present, and where life conditions are favourable. They are usually microscopic, and some of the most minute forms of life known are monads of the flagellate *Infusoria*. Many of the ciliate forms have very striking shapes, and are commonly denoted by the terms of their resemblances, such as the Bell-animalcule, the Slipper-animalcule, the Trumpet-animalcule etc. The minute organism, *Noctiluca*, to which the diffused luminosity or phosphorescence of the sea is due, is essentially nothing but a flagellate *Infusorian*.

So far we have discussed in a brief and popular manner the structure, the life history, and the general nature and affinity of the Animalcules—those different types of minute and lowly organisms which technically are known as the *Protozoa*. It is but fitting to conclude with a short outline, in general terms, of the part they are playing, and have played, in Nature ; and this will serve, in a sufficient manner, to illustrate their importance.

In all climes and at all depths, the ooze, covering and forming the bed of the sea, consists largely of the remains of the Animalcules. In extensive tropical areas, indeed, this ooze is essentially little more than the aggregated tests of *Foraminifera* and *Radiolaria*, though the relative proportions of these vary considerably. In the warmer and shallower waters, the Foraminiferal remains, chiefly those of the organism, *Globigerina*, already referred to, predominate to such an extent that the ooze is described as being "*Globigerina* ooze". The

calcareous and siliceous tests of the Animalcules, mixed with the remains of other organisms, such as shells, corals, fish and minute plants, and with earthy and volcanic débris, are gradually forming rock systems, which will probably be the sites of future continents or islands—a part which they have played in Nature from the earliest ages in the history of the Earth to which we have any clue. Geology teaches us that the earliest sedimentary rocks with which we are acquainted, are made up, or consist largely, of the remains of Animalcules, comparable to existing forms; and probably many of the derived rocks have a similar origin. From those early ages up to modern times, Animalcules have played a corresponding part, and whole formations of immense thickness and extent have been built up from them.

Again, the Animalcules serve as food for many of the higher animals. Though individually minute, yet in the large numbers in which they exist, they form considerable masses, and other oceanic surface animals are largely dependent on them; while in the deep sea, where no vegetable life exists, they are, relatively, of still greater importance. The dead organisms which fall to the bottom from the surface, moreover, fall as a constant rain of Animalcules, and the protoplasmic substance of these is preserved for a comparatively long time. This constant supply of food material is one of the chief sources of the food of deep-sea animals.

The study of the Animalcules furnishes an inexhaustible source of interest for scientific and unscientific people, for amateur and professional naturalists. From this study have been derived some of the most important scientific results of modern times—results that have not

only thrown new light upon the structure and relations of the forms of life, but have even helped to revolutionise the conceptions of Life itself. The study of these organisms has been instrumental in directing attention to the study of all minute forms; and humanity, in the fields of medicine and of commerce, is reaping, and will still more surely reap, the harvest of this research.

Occasional Notes.

Do Scorpions commit Suicide?—Quite a controversy has been maintained in recent years, by rival experimentalists, as to this question, which, after all, until the early part of this year, was left in a more or less unsatisfactory condition. Quite recently Prof. BOURNE of Madras has thoroughly investigated the subject and has set forth the results in a paper communicated to the Royal Society of London, an abstract of which was published in *Nature*, April 21, 1887, from which the following is taken :—

"The most important of Mr. Bourne's propositions is that the poison of a scorpion is quite powerless to kill the same individual, or another individual of the same species, or even scorpions of other species. If this proposition is established, there can of course be no further controversy about the matter. *A priori*, it is not improbable, for Sir Joseph Fayrer has shewn that the cobra poison will not affect a cobra. Mr. Bourne frequently took a scorpion in his hand, and holding the sting between a pair of forceps pricked the scorpion with the sting and squeezed out its poison. There was a little bleeding from the wound, but in every case the scorpion lived for days. He also tried stinging one scorpion with another, using in the first instance specimens of the same species, then specimens of different species. Occasionally, he thinks, the stung individual became a trifle sluggish, but it never died from the sting. In order to make sure that his method of squeezing out the poison was perfectly effective, Mr. Bourne, after stinging a scorpion, sometimes continued to hold the sting, and, taking a cockroach, squeezed out into it some more of the poison. The cockroach invariably became very sluggish at once and died in an hour or so."

Various experiments were made on insects and crabs, and again on spiders and other allies of the scorpions, and in every case partial or complete paralysis, followed

by death, was the result. Special care was taken that no mechanical injury should be done to the nerve ganglia; and the effect of simple puncture, without scorpion poison, was tried. In all cases where simple puncture produced no ill effects whatever, the introduction of scorpion poison caused instant paralysis and death within a very short space of time.

Scorpions kept in confinement are easily induced to fight. Mr. BOURNE kept scorpions in confinement, and observed them repeatedly sting each other while fighting, and yet they lived perfectly well.

It was formerly believed that scorpions when placed within a ring of fire, after making frantic and futile efforts to pass the circle, would deliberately commit suicide by stinging themselves to death. Mr. BOURNE'S experiments have shewn that under such circumstances the scorpions certainly would lash about marvellously with their sting and even accidentally wound themselves, but that death resulted not from the poison which really has no fatal influence on the scorpion itself, but from the heat of the fire which surrounded it.

Prof. LLOYD MORGAN fully confirms Prof. BOURNE'S conclusion that the poison of the scorpion has no fatal effect on the same individual or another individual of the same or even allied species. He believes, however, as the result of his own experiments, that the poison has *some* effect, producing sluggishness and torpor for a while. He also confirms Sir JOSEPH FAYRER'S conclusion that the poison of the viper has no effect on itself—neither on the individual from which the poison is taken nor on other individuals of the same species.

At the same time it can easily be understood that

poisonous snakes and scorpions might wound themselves in a vital part and die of the wound independently of poison. Under local irritation these animals repeatedly strike to remove the source of irritation, and a dangerous wound in a vital part, caused by these means under excitement, by the animal itself, would certainly be fatal—a result that very naturally would be ascribed to the poison injected, though the wound, and not the poison, would be the real cause.

The question may now be regarded as settled. Scorpions cannot, any more than poisonous snakes, commit suicide by poisoning themselves—nor can they murder their relations by poisoning them.

A New Rat from British Guiana.—A new species of rat from the colony has been described and figured in the Proceedings of the Zoological Society, February 15, 1887, by Mr. OLDFIELD THOMAS, F.Z.S., Assistant in the Zoological Department, British Museum. The specimen, together with twelve other small mammals, was obtained by Mr. W. L. SCLATER, son of the Secretary of the Zoological Society, during his recent visit to the colony. The 13 specimens, collected at Maccasseema, Calacoon, and Plantation Hope, have been referred to 8 species, of which 5 are Bats, 2 are Rodents and one is a Marsupial.

The new rat, from Maccasseema, is the first form of its sub-genus, recorded from the region north of the Amazons and East of Columbia. It was given to Mr. SCLATER by one of the Indians at Maccasseema, and

did not live in the house. It is closely allied to a Peruvian form, from which, however, it can easily be distinguished by its softer, darker, and more velvety fur, and by its black toes—in the Peruvian form the toes are white.

The rat has been named after Mr. SCLATER, and is thus described:—

Hesperomys (Rhipidomys) sclateri, sp. n.

Fur short, close, very soft and velvety. General colour uniform dark ashy grey, the tips of the hairs below white or pale rufous, line of demarcation not strongly marked; bases of all the hairs slate-coloured. Hairs on both fore and hind feet, including the fingers and toes, all dark brown or black. Ears, when laid forward, reaching just to the centre of the eye; no projection on their anterior border; their backs hairy, black. Tail long, uniformly black, thickly hairy, the hairs about 3 or 4 mm. long throughout, except just at the base, where they are shorter, and at the extreme tip, where they are 10 or 12 mm. long; the rings of scales well-marked, 15 or 16 to the centimetre. Mammæ 6, one axillary and two inguinal pairs. Interdental palate-ridges 6. Foot-pads broad, smooth, rounded; soles naked, quite smooth.

Skull exceedingly similar to that of *H. leucodactylus,* Tsch. (figured P. Z. S. 1884, pl. xliv. fig. 8), but rather longer and narrower, especially in the cranial portion, with the supraorbital edges more strongly developed, and with the incisors rather longer and heavier.

Dimensions of the type, an adult female in spirit:—Head and body 133 mm., tail 172, hind foot 33, forearm and hand 39, ear, above crown, 16, head 43, muzzle to eye 18·5.

Skull. Basal length 31·5, greatest breadth 19; nasals, length 12·8; length of molar series 6·4; back of incisors to front of m′. 10·2; palatine foramen, length 8·0; interorbital constriction 6·3.

British Guiana & West Indian Woods at the Edinburgh International Forestry Exhibition.—The following notes on Woods exhibited by British Guiana and the

West India Islands at the Edinburgh International Forestry Exhibition, have been sent me by Mr. HAWTAYNE who translated them from a pamphlet by Monsieur E. REUSS :—

A copy of a pamphlet, on the International Forestry Exhibition held at Edinburgh in 1884, from the pen of Monsieur E. REUSS, an Inspector of Forests and Tutor to the French National School of Forestry, has been forwarded to the Royal Agricultural and Commercial Society by the Government Secretary.

M. REUSS devotes a few lines to a notice of the Exhibits from British Guiana in which he informs his readers that the specimens from this colony occupied almost as much space as did those in the Indian Section, and that of the 130 varieties of wood found in this part of the world some are very heavy. He also states that the most useful of our timbers belong to the genera *Nectandra* (Greenheart,) and *Sapota* (Bullet), but one is surprised to find *Tecoma* and *Cordia* ranked with these, since of the former the "hackia" is the only species used here, and then only for shovel sticks &c., while as I am informed by Mr. JENMAN, there is no *Cordia* in the colony of which the timber is used. The writer observes that nowhere in the colony is there evidence of a conservancy of forests, and that the forests belong to the Government which grants them in lots to the colonists causing an unceasing diminution of accessible material. M. REUSS reports that half the forest-products are exported, and that in 1876 the value of timber sent to Great Britain was 1,654,475 francs or about $330,895, being ten times more than in 1872.

The British Guiana Exhibits though equal in number and bulk to those from India, were, in M. REUSS' opinion, far from possessing the same interest, and this he considers is attributable to there being no forestry department in the colony. Remembering M. REUSS' official position one is tempted to quote "vous êtes orfèvre M. JOSSE."

Among the raw and manufactured products, however, M. REUSS found numerous and large samples of valuable woods of "vivid tint", barks, tanning materials, and a multitude of domestic articles and tools, in which wood or some other available part of a tree, was the principal material.

M. REUSS winds up by remarking that the only publication shown, relating to Guiana, was a work on anthropology.

Since "Timehri" is read in the West Indian Islands where this work of M. REUSS may not reach, I may add that of the exhibits from St. Vincent, M. REUSS remarks that, in spite of the smallness of the island and its non-importance from a forestry point of view, the Government had brought before the public a large number of articles such as specimens of wood, models of huts and boats &c., which, however, were not worthy of special notice. He considers that the products of this island are much about the same as those of British Guiana, and that *Nectandra* is well represented. I am afraid M. REUSS is scarcely correct in this view. He goes on to say that the conservancy of the woods, and the rights of the Crown over this portion of the island, are not clearly established. It may be remarked that the earlier proprietors of plantations in St. Vincent were allowed to occupy the ungranted lands next their allotments until these were required by the Crown. There appears now to be some scheme for creating a "peasant proprietary", and Crown lands are to be acquired on certain (or uncertain) terms in small lots. Whether squatting, to the advantage of neither Crown nor estate owner, does not result, remains to be seen. M. REUSS adds that the forests in St. Vincent are disappearing, and that possibly the drought which existed when he wrote may be the result. This evil may be aggravated by indiscriminate clearing of new allotments. So greatly was the influence of trees with regard to rainfall appreciated in this Island, that on its eastern coast, a thickly wooded hill was in former years carefully conserved under Legislative enactments as a means of attracting rain. Tobago appears to have been the only other West Indian Island represented. M. REUSS states that the kinds of wood found in St. Vincent and Guiana are also found in this tiny member of the Antilles, and that the annual encroachments on its forests are so trifling as not to require any measures for their preservation. The timber exports are very small and the people of Tobago will be surprised to hear tbat they consist chiefly of mahogany.

The Tobago exhibits were but few and small, consisting of vertical and transverse sections of wood, seeds, &c., none being of much importance.

It may be added that Mr. WM. RUSSELL on his return from this Exhibition spoke in glowing terms of the admirable way in which the Japanese specimens and exhibits were shown at the Edinburgh Exhibition. Mr. REUSS also reports in the highest terms of the complete manner in which the Japanese products, raw and manufactured, were

exhibited, and of the instruction to be gained from an examination of them.

The timbers of British Guiana, it is true, have not as yet profited to any appreciable extent from either the Forestry or other Exhibitions, but it may be that a complete collection of samples, as full, comprehensive, and attractive, as was that shewn by the Japanese, might be of service in attracting dealers and manufacturers, on the look out for "new notions" in timber.

A New Entomogenous Fungus from British Guiana—. A remarkable fungus growing on a large black ant (*Camponotus atriceps*), found by Mr. C. A. LLOYD on the banks of the Puruni, has recently been described and figured in the Annals and Magazine of Natural History (October 1886) by Mr. WILLIAM FAWCETT, B. Sc., F.L.S., late Assistant in the Botanical Department, British Museum, and now Director of the Botanic Gardens, Jamaica. The specimen was the only one met with by Mr. LLOYD, though he has collected several specimens of different species of ants. The same species of ant in Brazil is infested with another, but closely allied, fungus; while the new fungus bears a great resemblance to, and possibly is identical with, a species described from New Guinea, where it grows not on an ant, but on an entirely different insect, viz., a *Coccus* or Scale-insect. It appears that the fungus attacks the ant while it is living, and that the fine basal mycelial threads, growing through the body, gradually exhaust it, until they grow out at the various joints, and ultimately attach the ant to the leaf on which it

stands, while a thin stalk bearing above a globular body, containing spores, grows out behind the head.

Mr. LLOYD'S name is given to the species, and it is thus described :—

Cordyceps Lloydii, nov. sp.

Stromatibus solitariis, pallide ochroleucis, ex articulo cervicali enatis ; *capitulum* perithecigerum depresso-globosum, altitudine circ. 0.7 mill., latitudine circ. 1.5 mill. ; *stipite* filiformi, infra medium autem incrassata, longitudine 4.5 mill., crassitudine ad basim apicemque 0.25 mill., infra medium 0.5 mill. ; *peritheciis* stromate immersis protracto-ovatis ; *ascis* longissimis, cylindraceis, apice glandiformibus, circiter 160 mmm. aparaphysatis ; *sporidiis* filiformibus, asci longitudine, hyalinis, immaturis.

Snake-poison and its Remedies—The vast importance of the subject itself will be a sufficient excuse for this reference to a series of facts with which, or with most of which, most people are familiarised. The fact that up to the present time no antidote is known capable of counteracting or neutralising the action of snake-poison, is sufficient to evoke interest, the more especially when it is borne in mind how terrible are the pangs of death caused by snake-poison, and how distressing and painful, the accompaniments of a partial recovery from the venom. The subject, moreover, is one of local interest ; for in British Guiana are to be found some of the most poisonous snakes, and, of these, some of the largest known. Let it be acknowledged, however, that there is an extreme paucity of cases where people have been bitten and have died from the bite, and that the instances are comparatively few and far between, in which, of certain

knowledge, poisonous snakes have been seen by, or have been in dangerous proximity to, individuals. Harmless snakes are much more numerous and common than poisonous snakes; and in the generality of cases where a snake has been imperfectly observed, or observed by people really ignorant of their kind, and have been described by the names of dangerous snakes, it is likely that only a harmless snake was really seen—a presumption that is a good deal strengthened by the fact that, even where a harmless snake of any size can be seen under the most favourable circumstances, the protrusion of a pointed, forked tongue is sufficient for most people, to warrant the application of "poisonous" to the poor snake: for indeed the delusion is a wide-spread one that the forked tongue is a sting or poison-organ of some kind. In the same way, it is likely that many of the bites which have been attributed to poisonous snakes, have really been given by harmless ones; and this will partially serve to explain the extreme simplicity of many of the remedies said to have been employed in reputed cures, and the number of such reputed remedies in various countries, as well as the fact that when brought to the test of experiment on living animals, the reputed remedy is a failure. The nostrum may once have had effect in allaying the nervousness of an individual after having been bitten by a snake, but most likely has not been a remedy for the venom of a poisonous snake. A consideration that is most damnatory to the efficacy of certain reputed remedies, is the fact that with many of these remedies the preparation demands a series of operations that would hardly be completed before the death of the person had taken place—on the assumption

that the person had been bitten by an ordinary poisonous snake under ordinary conditions. Special conditions, however, might make all the difference imaginable. A good deal depends on the kind of snake—its size, species and actual condition at the time—on the nature, depth and condition of the bite, and on the individual bitten; and what may have been a remedy, in one case, for a bite of but little danger, although from a poisonous snake, may prove of not the slightest use in case of a bite, even from the same snake, of serious importance.

As specimens of "cures," I give the following two, for which I am indebted to Mr. H. J. PERKINS, to whom they were given at the Gold Diggings with the information that they had proved successful in this colony—one in a case of a bite from a Labarria. Mr. PERKINS gave them to me simply as samples, having no real knowledge of them; and I must confess that it would be interesting to know something more definite as to the cures effected, and the method by which it was arrived at that these remedies *were* remedies. The simplicity of the remedies is admirable, though some of the ingredients might not, unfortunately, be procurable in the bush. In the case of a bite from an undoubted poisonous snake, I certainly do not recommend the use of either of them, if it be possible to obtain ammonia or carbolic acid, and brandy or whisky, etc. Failing these known and useful remedies, there could be no harm in trying them, there might possibly be benefit.

1. Take a table-spoonful of sugar; mix with a wineglassful of water, and drink at once; then take a large uninjured onion, strip off outer covering, and roast whole till of a deep brown colour; break it up and apply hot to wound; keep it in position for five hours with a tight bandage.

2. Take a double handful of conami leaves *(Clibadium asperum)*; pound well into a pulp; add a pinch of common salt, and two tablespoonfuls of sugar (molasses sugar is the best); apply as a poultice, and renew every two or three hours, till relief be obtained.

The latest information on the subject is to be found under the heading "Snakes" in the Encyclopædia Britannica, vol. xxii, which has only just been published; and the following rather lengthy quotations are deserving of mention not only from their interest, but also from the fact that they embody the latest and the best information from an undoubtedly trustworthy source:—

Chemistry has not yet succeeded in separating the active principle of snake-poison or in distinguishing between the secretions of different kinds of poisonous snakes; in fact it seems to be identical in all, and probably not different from the poison of scorpions and many *Hymenoptera*. The physiological effects of all these poisons on warm-blooded Vertebrates are identical, and vary only in degree, the smallest quantities of the poison producing a local irritation, whilst in serious cases the whole mass of the blood is poisoned in the course of some seconds or minutes, producing paralysis of the nerve-centres. That there is some difference, however, in the action of the poisons upon the blood has been shown by FAYRER, who found that the poison of Viperine snakes invariably destroys its coagulability, whilst nothing of the kind is observed in animals which perished from the bite of a colubrine venomous snake. The same observer has also experimentally demonstrated that the blood of a poisoned warm-blooded animal assumes poisonous properties, and, when injected, kills like the poison itself, although the bodies of the animals may be eaten by man with impunity. On the other hand, he has proved that the opinion generally adopted since REDI's time, that snake-poison is efficacious only through direct injection into the blood, is fallacious, and that it is readily absorbed through mucous and serous membranes, producing the same effects, though in a milder degree.

The degree of danger arising from a snake-bite to man depends in the first place on the quantity of poison injected: a large vigorous snake which has not bitten for some time is more to be feared than one of small size or one which is weakly or has exhausted its stock of

poison by previous bites. The bite of some of the smaller Australian Diemenias and *Hoplocephali* is followed by no worse consequences than those arising from the sting of a wasp or a hornet, while immediately fatal cases are on record of persons bitten by the cobra or the large South-American Crotalines. In the second place it depends on the strength of the individual bitten: a man of strong physical constitution and energetic mental disposition is better able to survive the immediate effects of the bite than a child or a person wanting in courage. Thirdly, it depends on the position and depth of the bite: the bite may be merely a superficial scratch, or may penetrate a vein, producing immediate and fatal effects. It must be mentioned also that FAYRER is distinctly of opinion that the poison of some kinds is more powerful than that of others. The mere shock produced by the bite of a snake upon a nervous person may be sufficiently severe to be followed by symptoms of collapse, although no actual poisoning of the blood has taken place, or although the bite was that of an innocuous snake. It is said that persons have actually died under such circumstances from mere fright. The local appearances in the neighbourhood of a poisoned wound, which soon after the bite is much swollen and discoloured, and very painful, readily proves its character.

Unfortunately no antidote is known capable of counteracting or neutralizing the action of the snake-poison. Some years ago injections of ammonia or liquor potassæ were recommended, but there is the obvious objection that hardly in one out of a thousand cases of snake-bite would either the appliances or the operator be at hand. FAYRER'S experiments, however, have distinctly disproved the efficacy of this remedial measure. Equally useless is permanganate of potassium; it is indeed true that a solution of this compound destroys the properties of snake-poison when mixed with it; and therefore such of the poison as remains in the wound will be neutralized by the external application or injection of the permanganate, but the remedy is entirely without effect after the poison has passed into the circulation. Treatment is therefore limited to endeavours to prevent by mechanical means the poison from entering the circulation, or by chemical agencies to destroy or remove as much of it as possible that remains in the wound, and to save the patient from the subsequent mental and physical depression by the free use of stimulants. Whatever is, or can be done, must be done immediately, as a few seconds suffice to carry the poison into the whole vascular system, and the slightest delay diminishes the chances of the patient's

recovery. Courageous persons badly bitten in a finger or toe are known to have saved their lives by the immediate amputation of the wounded member.

(1) If the wound is on some part of the extremities, one or more ligatures should be made as tightly as possible at a short distance above the wound, to stop circulation; this is most effectually done by inserting a stick under the ligature and twisting it to the uttermost. The ligatures are left until means are taken to destroy the virus in the wound and other remedial measures are resorted to, or until the swelling necessitates their removal. (2) The punctured wounds should be enlarged by deep incisions, to cause a free efflux of the poisoned blood, or should be cut out entirely. (3) The wound should be sucked either by the patient or some other person whose mouth is free from any solution of continuity. Cupping-glasses, where they can be applied, answer the same purpose, but not with the same effect. (4) By cauterization with a red-hot iron, a live coal, nitrate of silver or carbolic or mineral acid, or by injections of permanganate of potassium, the poison which remains in the wound can be destroyed or neutralized. Ammonia applied to the wound as a wash and rubbed into the neigbouring parts is likewise undeniably of great benefit, especially in less serious cases, since it alleviates the pain and reduces the swelling. (5) Internally, stimulants are to be taken freely; they do not act as specifics against the virus, but are given to excite the action of the heart, the contractions of which become feeble and irregular, to counteract the physical and mental depression, and to prevent a complete collapse. Brandy, whisky, and ammonia in any of its officinal forms should be taken in large doses and at short intervals. The so-called "snake-stones" can have no other effect than, at the best, to act as local absorbents, and can be of use only in the very slightest cases.

It may perhaps be advisable to mention that, though suction of the wound is recommended, some authorities consider it of but little, although of some, use; and considering that there is a possibility of the poison from the wound being absorbed by the mucous membranes of the person who sucks it, it might be as well to resort to it only in extreme cases.

A Snake-combat.—In the Museum a short time back, a brief but decisive combat took place between a small land-camoodi (*Boa constrictor*) nearly three feet in length and a large yellow-tail (*Spilotes corais*) about eight feet long. The yellow-tail was placed in the camoodi's cage; and, almost at once, the camoodi seized it around the neck and body in order to constrict it. To this the yellow-tail had decided objections; and, using its comparatively great strength with good effect, it not only forced the grasp of the camoodi, but soon placed the small snake at such a disadvantage that it was unable to prevent itself from being seized by the head and gradually swallowed. The clerk at the Museum, who witnessed the struggle, tried to separate them, but without success; and the camoodi paid the penalty of its temerity and afforded a meal for the yellow-tail. Later in the day when the yellow-tail was seen by me, it was decidedly well furnished and comfortable. No emetic was administered—the result being considered most doubtful.

Parietal eye in Iguana.—Recent research carried on by Mr. BALDWIN SPENCER has brought to light the very curious fact that, in *Iguana* and in several other lizards, there exists, besides the two ordinary eyes, a single median eye situated in the fleshy substance directly above the middle part of the brain. This *parietal eye*, as it has been termed, can scarcely, however, be imagined to assist in vision, since it is so deeply buried in the flesh as to

prevent light reaching it. It has, however, the fundamental structure of an eye, being supplied with a median nerve from the brain, and this nerve is distributed to form an apparently sensitive visual area. The arrangement of the layers in this visual area, is, however, on the plan not of the ordinary eyes of the vertebrate animals, but of the eyes of the inverbetrates, such as the snails, cuttle-fishes, etc. This is an extremely important and interesting fact, since one of the lowest allies of the vertebrates, the Ascidians, a group once classed close to the snails and cuttle-fishes, possess in early life a single, median eye imbedded deeply in transparent flesh where light can reach it. This parietal eye of *Iguana*, from its position and structure, thus seems to be a survival from a primitive condition. In development, it arises as a small outgrowth from the roof of the brain. The outgrowth becomes constricted, the upper part to form the "eye", the connecting part the nerve. A parietal eye has lately been discovered in fishes, and doubtless important additions will soon be made to our knowledge by the researches of BEARD who is investigating the matter.

A profitable Sugar-palm.—The following passage from WALLACE'S "Tropical Nature" seems worthy of more than a passing notice—particularly at this time when every possible attempt is being made to lessen the cost of sugar production from the sugar cane, often by means of experiments entailing very considerable expense. It seems a good opportunity for some of our wealthy capit-

alists to at least begin experiments with this palm—although no immediate returns could be expected. The diminution of expense in the cultivation of the palm as against sugar cane, would be due not only to the saving in manure and in the cost of cultivation, (as pointed out by WALLACE,) but also in the fact that elaborate and costly machinery would, to a great extent, be done away with :—

The sap which pours out of the cut flower-stalk of several species of palm when slightly fermented forms palm-wine or toddy, a very agreeable drink; and when mixed with various bitter herbs or roots which check fermentation, a fair imitation of beer is produced. If the same fluid is at once boiled and evaporated it produces a quantity of excellent sugar. The *Arenga Saccharifera*, or sugar-palm of the Malay countries, is perhaps the most productive of sugar. A single tree will continue to pour out several quarts of sap daily for weeks together, and where the trees are abundant this forms the chief drink and most esteemed luxury of the natives. A Dutch chemist, Mr. DEVRY, who has studied the subject in Java, believes that great advantages would accrue from the cultivation of this tree in place of the sugar-cane. According to his experiments it would produce an equal quantity of sugar of good quality with far less labour and expense, because no manure and no cultivation would be required, and the land will never be impoverished as it so rapidly becomes by the growth of sugar-cane. The reason of this difference is that the whole produce of a cane-field is taken off the ground, the crushed canes being burnt; and the soil thus becomes exhausted of the various salts and minerals which form part of the woody fibre and foliage. These must be restored by the application of manure, and this, together with the planting, weeding, and necessary cultivation, is very expensive. With the sugar-palm, however, nothing whatever is taken away but the juice itself; the foliage falls on the ground and rots, giving back to it what it had taken; and the water and sugar in the juice being almost wholly derived from the carbonic acid and aqueous vapour of the atmosphere, there is no impoverishment; and a plantation of these palms may be kept up on the same ground for an indefinite period. Another most important consideration is, that these trees will grow on poor rocky soil and on the steep slopes of ravines and hill sides where any ordinary

cultivation is impossible, and a great extent of fertile land would thus be set free for other purposes. Yet further, the labour required for such sugar plantations as these would be of a light and intermittent kind, exactly suited to a semi-civilized people to whom severe and long-continued labour is never congenial. This combination of advantages appears to be so great, that it seems possible that the sugar of the world may in the future be produced from what would otherwise be almost waste ground; and it is to be hoped that the experiment will soon be tried in some of our tropical colonies, more especially as an Indian palm, *Phœnix sylvestris,* also produces abundance of sugar, and might be tried in its native country.

Gold in British Guiana.—The matter is now placed beyond dispute, that gold exists in paying quantities in British Guiana. The spasmodic efforts made to obtain it yielded in 1885, as far as official returns are concerned, 939¾ ozs.; in 1886, 6,518$\frac{3}{40}$ ozs.; and already in 1887, during the first six months, in spite of most unfavourable weather 4,991 ozs. 13 dwts. 17 grs. have been obtained—that is, that an amount nearly three-fourths of that obtained in the whole of the year 1886, has already been obtained in the first six months of 1887. In 1886, gold had already taken the fourth place among the exports of the colony—but when it is considered that sugar, rum and molasses, which took the first, second and third places respectively, are practically the results of one industry, it will be seen that really the gold industry ranks next to that of sugar. By some, as for instance by such a writer as PALGRAVE, the discovery of gold has been considered somewhat in the light of a curse to a country—a will-o'-the-wisp that leads to destruction; but to an unbiassed

mind that will calmly review the facts of the case—that will look widely and note the causes that have led to the rapid development and the commercial prosperity of such districts as British Columbia, California, New Zealand, and the magnificent Australian Colonies, it will be evident that there is nothing so calculated to rapidly populate, and add to the importance of, an undeveloped region as the discovery of gold, in large quantities, within its boundaries.

The genesis and distribution of Gold.—In connection with the gold industry of the present, it may be interesting to remark Prof. NEWBERRY'S summary as to the genesis and distribution of gold, quoted by LOCK in his "Gold."

First. Gold exists in the oldest known rocks, and has been thence distributed through all strata derived from them.

Second. In the metamorphosis of these derived rocks, it has been concentrated into segregated quartz veins by some process not yet understood.

Third. It is a constituent of fissure-veins of all geological ages, where it has been deposited from hot chemical solutions, which have leached deeply-buried rocks of various kinds, gathering from them gold with other metallic minerals.

Fourth. By the erosion of strata containing auriferous veins, segregated or fissure, gold has been accumulated by mechanical agents in placer deposits, economically the most important of all the sources of gold.

Leaf-cutting Ants—Remedy.—I have heard occasionally of cases in country districts where it has been impossi-

ble, or has been deemed impossible, to grow fruit-trees and vegetables owing to the depredations of the leaf-cutting ants, which, in a very short space of time, strip the plants of all their foliage. Mr. BELT in "The Naturalist in Nicaragua" relates how, in a district where the ants were very abundant and where complaints were rife and gardens barren, he was enabled to grow, in spite of the ants, large quantities of fruits and vegetables that were particularly appreciated by them. On finding the ants in his garden beginning their work of destruction, he followed their track to their nest—and here he began his war against them. Making a mixture in the proportion of one pint of common brown carbolic acid to four buckets of water, he poured this down and over the nest, in sufficient quantity to saturate it. The result was striking. The ants left the garden to protect their home, and for the next few months were occupied in other districts building a new nest. Again they returned, however; and following them to their nest, he treated them as before, and with a similar result. They attempted a migration to their former nest, but being check-mated in this direction, betook themselves to fresh fields and pastures new. By carefully watching the garden, so as to detect the first approach, and by warring against the insects with his mixture in their very home, he succeeded in keeping them at bay, and in reaping his harvest of fruit and vegetables.

He found also that crystals of Corrosive Sublimate (Bichloride of Mercury) had a most wonderful effect on the ants in the dry season. At such times, sprinkled in or across their track, it maddened the insects, which, rushing about, attacked their fellows and caused a war

of extermination all along the line even to the very nest. Sprinkled in the openings of the nest, the crystals would naturally have a still more marked effect. Coal-tar was also effectively used to break the course of a track. Necessarily, constant attention is required, so that remedial steps should be taken *before* the mischief is done. *Le jeu vaut la chandelle.*

Natural and Artificial Coloration in Birds.—My attention has recently been directed by Mr. E. E. H. FRANCIS to a note in the Pharmaceutical Journal, June 1869, on the occurrence of the pigment *turacine* in the red feathers of certain "Plantain-eaters" (Musaphagidæ), through which a considerable amount of light is thrown on the alterations by artificial means of the colours of the feathers of living birds—a subject already discussed by Mr. IM THURN in a previous volume of *Timehri.**

The pigment turacine, discovered by Prof. CHURCH, is obtained from the feathers of several species of "Plantain-eaters", by treating the red barbs with weak caustic soda, which dissolves it out. The dissolved pigment is precipitated by hydrochloric acid, and, when washed and dried, presents the form of dark scales having a red-violet colour. It is remarkable in the fact that it possesses a definite and constant proportion of the metal *copper* in its constitution. The proportion is 5·9 per cent. of copper; and this amount is constant in the turacine derived from different species, and cannot be due to any ac-

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* *Timehri*, vol. III., p. 355.

cidental source whatever. The ash of turacine is pure, black copper oxide. The pigment is only present in the red feathers: and the birds, when bred in England and kept in confinement, produce the same copper pigment. The plantain fruits, on which the birds chiefly feed, have been found to contain distinct traces of copper.

We see from this, then, that the red colour in these birds is due to the presence of turacine, and that the formation of turacine depends on the presence of the metal copper in the food material. The chief food material that supplies the copper seems to be plantain. If, therefore, food other than plantain, food in which no copper was present, alone was supplied to the birds, it would be an impossibility for them to elaborate turacine, and they would thus be unable in the course of time, to supply the place of any red feathers, which might be lost, with feathers of the same hue. If, therefore, under these conditions, the feathers were plucked out after some time had elapsed, or the bird moulted, the new feathers must take on some other colour, dependent on the kind of pigment produced under the changed conditions of life—a pigment the nature of which could only be determined by experiment in each individual case.

It would be extremely interesting to have determinations made of the different pigments that impart characteristic colours to the feathers of birds, the purples, blues, greens, yellows, oranges and reds; to determine whether similar colours in different groups of birds were due to the presence of similar pigments; and to ascertain the changes in pigments, and hence the changes of coloration, produced by withholding from the birds that kind of food containing what may be looked upon as the

more remarkable ingredients of its original pigment—as for instance, by withholding food containing metallic elements, where these are not commonly distributed in food materials generally.

Through this dependence of coloration on the presence of certain kinds of food material from which special elements are extracted, we have a natural explanation of the variability or of the apparent tendency to variability, as regards feather coloration, in birds of the same, or closely allied, species under different life conditions or in different localities. Probably in this same direction must be sought the explanation of the changes of coloration in many birds on reaching their adult stage. A difficulty meets us, however, in the case of those male and female birds of the same species, where the two sexes take on a strikingly different coloration : for either the male bird eats some special kind of food not eaten by the female, and thus derives some essential ingredient, not obtained by the female, for special pigments; or there must be an entirely different re-arrangement of the essential food elements in the two sexes when the food materials are the same, and the characteristic coloration different. The case, however, is one that could certainly be determined by experiments. Probably also the remarkable diversity in the coloration of the same species of domestic fowls, is capable of explanation on the lines of food material—the diversity being brought about by the varied and varying diet of such omnivorous birds, through a long course of time—modified in this, as in all other cases, by the inter-breeding of birds of different coloration.

In the case described by Mr. IM THURN as practised

among the Macoosi Indians, where the growth of yellow, instead of red, blue, or green, feathers is obtained in parrots and macaws, the change in colour is evidently brought about, as suggested by Mr. IM THURN, by the change of food—a change through which certain essential constituents of the red, blue and green pigments are not elaborated, probably because they are absent from the food eaten in captivity. Chemical analyses of the original red, blue and green pigments and of the resulting yellow pigment, are much to be desired in this case; for then we should know definitely not only what are the essential constituents of the red, blue, and green colours, and of the resulting yellow tint; but also the reason why the change in each case is to one uniform yellow colour. Possibly some metallic constituent is present in the original pigments, as in the African Plantain-eaters; and this metallic constituent may be different in the different colours or may consist of one element differently combined. It would not then be difficult to account for the fact that, the metallic element or elements not being elaborated because they are absent from the food eaten in captivity, a uniform, yellow, basal pigment is produced.

A change, produced by artificial means, in the coloration of birds, and one to which I can find no reference in any published volume, seems to be more or less commonly practised by bird-stuffers in the colony—I refer to the change of the natural purple tints in the colours of the Cotingas, the purple being changed to a lively red by the application of heat, in each case, to the feathers of the dead bird. It seems possible that this change can also be produced in the feathers of the living bird; but I have not been able to obtain any satisfactory information on this point.

The change thus produced is a noteworthy and interesting one: for it seems to be an entire alteration in the pigment of the feathers—one brought about by the abstraction of some essential constituents, such as the component parts of water, or by the re-arrangement of the original component parts. It is also noteworthy that the change is brought about by the application of heat, the great inducing agent in chemical re-arrangements and combinations. I hope, in a future number, to be able to say something more on the original purple pigment present in these birds and on the red coloration artificially produced.

J. J. Q.

Report of the Meetings of the Society.

Meeting held 13th of January.—Henry Kirke, M.A., B.C.L., President, in the chair.

There were 26 members present.

Elections.—*Members :* Thos. Hubbard, D. Y. C. Hill, W. J. Fowler, Rev. J. Keelan, Thos. Watt, Rev. W. J. West, J. B. Finney, Wm. Cunningham, A. A. Burrowes, W. H. A. Burrowes, F. W. Collier, A. C. Playfair, F. A. Winter, J. Jordan, Thos. Woodman.

Associates : Donald Cameron, J. H. Erskine, M. Eleazer, J. McConnell, Colin de Ros, E. M. de Groot, A. D. Iskenius, H. F. P. May, R. H. Themmen, L. Lambert, W. J. E. Whitney, A. B. Anderson, Henry Legall, Patrick Fairbairn, J. J. Chapman, F. S. Chapman, C. W. Bynoe, J. T. Green, Gershom Beste, John Anderson, C. H. Gale.

The Chairman stated that there was no written report from the Directors, but he might inform members verbally that the newly elected directorate had met, and had decided on the following matters :—

(*a*) To open the Reading-Rooms at night up to 10 o'clock, commencing from the 1st February, and to continue the same as an experiment up to the end of June, by which time it would be seen how much the privilege was appreciated by members.

(*b*) In the matter of arrears of subscriptions, the Treasurer and Secretary having carefully gone through the list, it was decided to strike off at once the names of all members who had died or who were absent, and those also who repudiated their membership or said they had previously resigned; all others would, in the meantime, be retained on the rolls, until the 1st March, when they would be dealt with as provided for in the rules.

(*c*) A competent person had been engaged to rearrange the Library and to prepare a classified catalogue of the books: to enable him to complete his work satisfactorily, the Directors had decided on closing the lending Library during the month of February and calling in all outstanding books.

(*d*) The memorial bust of the late Secretary, Mr. W. H. Campbell, having arrived, the Directors intended calling a special meeting for its public inauguration, of which due notice would be given in the newspapers.

He had also to report on behalf of the Agricultural Committee that the following office-bearers had been elected by that Committee for the present year:—

Chairman: R. J. Kelly.
Vice-Chairman: Hon. A. Barr.
Hon. Secretary: D. C. Cameron.

He had also to report that having failed to prevail on their old and valued Treasurer, Mr. Imlach, to accept his re-election to the office, Mr. F. A. Conyers had been selected to fill the post, and he congratulated the Society

on securing the services of that gentleman as Honorary Treasurer.

The Honorary Treasurer laid over the following statements:—

1. Annual Statement of the receipts and expenditure during 1886.
2. Quarterly Statement to 31st December.
3. Statement of Accounts for Local Museum.
4. Statement of Accounts for Local Exhibition.

On the motion of the President, seconded by Mr. M. Garnett, Messrs. J. S. Hill and D. C. Cameron were appointed Auditors to examine the accounts.

Mr. C. H. G. Legge in rising to propose the motions standing in his name, asked permission to alter the order of the motions, as he wished to propose the second one first.

This being allowed, he moved:—

That the ordinary members of the Society shall have the privilege of taking out a larger number of volumes of books than now allowed; that the distinction between "Ordinary Members" and "Associates" should be that "Associates" will only be entitled to the use of the Library and Reading-rooms, and that the by-laws and rules relating thereto respectively be altered accordingly.

Mr. N. D. Davis seconded the motion, which was supported by Mr. Wolseley, Mr. Chas. Winter and Archdeacon Austin; and opposed by Capt. Duncan, and Mr. de Jonge. Mr. Legge said he wished his motion to be taken simply as a recommendation to the Directors who would determine the number of volumes to be taken out by a member.

On being put to the vote, the motion was carried by a majority of one.

Mr. Legge then moved :—

That the by-laws and rules restricting "Associates" to certain classes and to persons whose income did not exceed £300 per annum, be rescinded, and that the by-laws and rules relating thereto be altered accordingly.

In a speech of considerable length, he combated the objections against his motion, raised at the previous meeting; and suggested that now that the Society was about to issue a new Catalogue prefaced with a copy of the rules, this would be a favourable opportunity for amending them where it was necessary or advisable to do so.

Mr. N. Darnell Davis in seconding the motion repeated his history of the manner in which the rule was first introduced, but questioned its legality, seeing it had never been published in the *Official Gazette* as required by the Ordinance of Incorporation. He also questioned the right of the Society to gauge the limits of respectability by merely a standard of income.

Mr. Mewburn Garnett thought they were going ahead with reformation too fast, and that possibly it might be wiser to pause a little for consideration. He therefore moved as an amendment that the motion be postponed.

Mr. Williams seconded the amendment.

Mr. Legge having stated that he had no objection to postponement, Dr. Anderson expressed a desire that the matter should be definitely settled at once in one way or another, and therefore moved as a second amendment that the original motion be put to the meeting. This having been seconded by Capt. Duncan, was carried. The original motion was then put to the meeting and lost.

Mr. Legge gave notice of the following motion :—

That this Society, recognising the necessity for taking more decided action for carrying out the objects which it was established to promote, and with the view of enlisting the sympathy of members, and thus stimulating individual efforts, Resolves that Sub-Agricultural Committees, composed of not less than two and not more than ten ordinary members of this Society, shall be appointed in various districts of the colony; that such Sub-Committees shall make reports at least once every quarter to the Agricultural Committee on matters relating to agricultural and general interests of the colony, and that the Directors shall, at the first general meeting in each year, present a report of the operations of the Society through its various Committees.

Mr. J. J. Quelch read a report on "A short trip into the Interior", recently made by him in company with Mr. Jenman.

A letter was then read from the Secretary to the Council of the Meteorological Office, asking that the Society should undertake and organise regular observations on the climate of Guiana. The matter was referred to the Committee of Correspondence.

Extract Letters were read from Mr. G. H. Hawtayne dated 2nd, 6th, and 15th November, 19th 20th and 24th November, and 13th December, referring to various matters of interest in connection with colonial exhibits, and enclosing special reports; namely :—

Report on *Fruit Shipments* by Mr. Morris.
,, ,, *British Guiana Coffee* by Mr. H. Pasteur.
,, ,, *British Guiana Cocoa* by Mr. W. Pink.
,, ,, *Preserved Fruit, &c.* by Mr. J. Gorer.

He also enclosed a paper by Mr. Holmes, Curator of the Museum of the Pharmaceutical Society, on the Drug exhibits in the Exhibition, with special paragraphs marked in reference to British Guiana specimens; and also a shipping list of specimens prepared from Coal tar presented by Mr. R. Le Neve Foster for the Local

Museum. These latter, the Secretary stated, had been received by the s. s. *Nonpareil*.

On the motion of Mr. Garnett, a vote of thanks was accorded to Mr. Hawtayne for the interest taken by him in the various matters dealt with in his letters, and the Secretary was directed to convey the thanks of the Society to the gentlemen named—Messrs. Morris, Pasteur, Pink, and Gorer—for their reports, and to Mr. Le Neve Foster for his contribution to the Museum.

On the suggestion of Mr. Davis the various matters treated of in the letters, were referred to the Agricultural Committee.

A letter was read from Mr. Walker, referring to Ridgway's bankruptcy, and holding out little hope of a dividend from the estate. Taken for notification.

A letter was read from the Government Secretary, dated 5th January, enclosing letter from "The James Driscoll and Sons Coy"., of the United States, in reference to the $100,000 prize for Agricultural Implements. Referred, with the previous enquiries on the same subject to the Agricultural Committee.

A letter from the Rev. W. H. Campbell, Rector of St. Michael's, on the subject of Arrowroot, was ordered to be laid over until the next meeting, and in the meantime to be placed at the disposal of the press.

The meeting then terminated.

The following are the reports, written for Mr. Hawtayne, on the subjects specified :—

FRUIT SHIPMENTS.

2nd November, 1886.

I received your letter and extract from the Demerara "Argosy" yesterday, and I should be glad to be able to offer some suggestions

with the view of helping forward this industry which had so much of promise in it. But it appears to me on the face of the article in the "Argosy" that the difficulty is not altogether with packing and stowing the fruit, but in making arrangements at this end to dispose of the fruit immediately on arrival, and so save loss by deterioration after it is taken out of the chamber.

As far as the selection and arrangement of the fruit at Demerara—all that is necessary is to select bunches that are uniformly *full* but not ripe. By being *full*, I mean the stage when the fruit has reached its full size, but has not begun to turn colour or get sugary and sweet. No fruit should be packed which shows any signs of ripeness; and in packing the bunches, it is important that they stand clear of each other to prevent "sweating", and have sufficient room not to rub one against another. I have not seen the arrangement of the cold chamber on board the "Nonpareil", but there is something, either in the temperature not being kept low enough, or in the packing and arrangement of the fruit in the chamber, which requires alteration.

The bananas from the "Nonpareil", I noticed, were wet and "soppy". This may be due to the bunches being suddenly taken out of the chamber and exposed to the warmer air outside; or it may be induced by overcrowding of the fruit in the chamber itself. Whatever may be the cause of this state of the fruit, it is one which requires some attention, as the fruit appears on this account to perish very quickly after landing, and is disliked by dealers.

I suppose Messrs. Scrutton & Sons have arranged so that the excess of moisture is removed from the chamber during the voyage, and that the air is kept as dry as possible. This is purely a matter of temperature.

It is only naturally to be expected that the first steps taken to import Colonial fruit to the English market should not be wholly successful; but if a company is formed with good connections amongst large dealers in London there would soon be a trade established on satisfactory and permanent lines.

D. MORRIS,
Assistant Director, Royal Gardens, Kew.

BRITISH GUIANA COFFEE.

38, Mincing Lane, E., 13th Nov., 1886.

I have carefully examined, roasted, and tasted the samples of the

British Guiana coffee you have been kind enough to send me, and I now have the pleasure of giving you my report upon them :—

No. 15, marked ordinary, J. P. Murphy, is a rather small, pale, even and nicely picked coffee, clean in taste, but thin and weak. Value 58s. to 60s. per cwt.

Sample marked Colonial Co., Pln. Mara, is a bold pale yellowish even sample, clean and pure tasted, but wanting in strength. Value 63s.

No. 16, marked N.G.D. Elephant, is a common dull brownish Liberian, it roasts badly, and tastes badly, oily and unclean. Value 45s.

Sample marked N.G.D., C. Arabica, pale greenish native kind, good size but bricky and tasting like Santos. Value 58s.

No. 17, Liberian, W. Smith, appears to be a mixture of pale native kind, and of the ordinary Liberian sort, it has a common oily taste though not so bad as No. 16. 52s.

The Liberian samples are so common, and roast and taste so badly, that I cannot sufficiently caution your colonists against growing this sort. It sells fairly well now, owing to the great reduction in the stocks of coffee and the rising tendency of the article, but with a full supply of Liberian (which I am afraid we shall see before long, as every one seems to have been going for it,) I have no hesitation in saying that Liberian will become very difficult of sale, and that prices will go down materially, even if other sorts keep their value. There is an oiliness in Liberian which, when roasted, becomes most offensive to the smell and taste.

The N.G.D., C. Arabica, the ordinary, J. P. Murphy, and the Pln. Mara are a very successful class of coffee; the first seems to have suffered a little in preparation, but has all the elements of good coffee, and with good preparation would probably be greener and nicer looking, and might be worth 5/ to 8/ per cwt. more: the 2nd and 3rd are nice looking, well picked, the Pln. Mara, especially, of very good size.

I think planters should be warned that sugar is an enemy to coffee in all its stages from its growth to its preparation, and the utmost care should be taken to keep the two at a distance from each other; especially in shipping coffee, care must be taken not to put it in the same vessel which carries sugar, as the effluvium from the sugar almost invariably ruins the coffee which is in the same part of the vessel. The Royal Mail Steamers alone can be trusted, as care is taken, if any sugar is on board, to place the coffee in a totally different part of the vessel; this is a matter of very great importance.

If there are no appliances to peel and prepare the coffee for shipment at Georgetown or on the estates, I would recommend planters to send their produce to London in parchment. The pulp, of course, must be removed on the estate as quickly after picking and as carefully as possible, and the parchment *must* be perfectly *clean* and *dry*: when in that state, it can be sent to London, not only without risk, but with the certainty that it will preserve the berry during the voyage. Highly successful and encouraging experiments have been made here during the present year, which show that coffee peeled and sized in London has kept its colour and quality extremely well, and has so far, in every case, realised more than the same kind of coffee prepared and peeled abroad. Suitable machinery has been put up at "Red Lion Wharf" and at "Metropolitan Wharf", and I believe that some of the Dock Companies contemplate erecting similar works.

I trust that the above remarks may be of some interest, and perhaps of use to the planters in your colony.

H. PASTEUR.

BRITISH GUIANA COCOA.

Mincing Lane, London, 18th Nov., 1886.

It is with much pleasure I hand you a report upon the samples of Cocoa exhibited in the British Guiana Court.

They at once attracted my attention from their remarkable quality and fine growth. No other cocoa in the Exhibition could compete with them except Trinidad, to which they bear great resemblance.

It seems to me that the soil and conditions of temperature and climate, must be quite adequate to the production on a good scale of a very superior cocoa, especially fitted for the use of English manufactures. I find on going through the samples again that there is a difference on the part of three of them compared with the other seven. No. 9, a bright red, unfermented, and rather small in size, is evidently the produce of an inferior tree. No. 5, some accident in the curing had deprived of its proper value. No. 11, which I understand is grown in Berbice, has also a distinct character, more allied to the growth of Surinam than to Trinidad, the flavour good, superior to Surinam, but differing from that of Trinidad.

Of the remainder, Nos. 7 and 8 are very large size, fine flavour, and the breaking up of the bean shows the color a *red brown* that is generally liked. No. 6, 6 a, 7 a, 12 and 13 are all after the style of Trinidad in their quality and flavour.

The seven samples I have separated from the rest are, in colour and appearance of the outside shell, good ; and one essential, the fermentation, has been very carefully carried out, producing an even colour in the breaking up of the fruit, which manufacturers like in their preparations. I should suggest the trial on the estates, where the seven samples came from, of the latest mode of curing used in Trinidad, that is, after the fermentation (carried out to the extent *only* as you have now done it), instead of washing the pulp or mucilage away from the shell, it should be dried upon the surface, and only slightly rubbed, just to get a reddish colour.

In giving this advice, I wish you to avoid the very high fermentation to which they subject Trinidad cocoa. The drying of the mucilage on the surface has the effect of sealing the shell, and thus not allowing any of the flavour of the fruit to escape.

The extent to which France and the United States now compete with England for Trinidad, will ensure a ready sale for all cocoa that you can produce of this character.

WILLIAM PINK.

No. 5 ZG R (Charles Ross) dark, brownish, dull break, no flavour, value 74s. per cwt.

No. 6 Noitgedacht, bold red, fine flavour, would bear higher fermentation, 85s. per cwt.

No. 6, Ariba, N. G. D., red, fine flavour, evenly fermented, 84s. per cwt.

No. 7, Caraccas, Weber, (Vryheid) bold bright red, fine flavour, 87s. to 88s. per cwt.

No. 7a, Caraccas, Wm. Smith (Vryheid) bright pale red, fine flavour, wants strength, 85s. per cwt.

No. 8, White, Weber (Vryheid) very bold red, picked, fine flavour, fine colour in the break, 87s. to 88s. per cwt.

No. 9, Houston, bright red, rather small, unfermented, 65s. to 66s. per cwt.

No. 11, Mara, red with a bloom on it, good flavour, red break, 82s. per cwt.

No. 12, Le Desir, red, fair size, red break, good flavour, 83s. to 84s. per cwt.

No. 13, Le Desir, white, red, little greyish, fair break, 80s. per cwt.

PRESERVED FRUITS, ETC.

113, Edgeware Road, London, Nov. 18th, 1886.

In response to your request to present to you a report on the food products of British Guiana and their commercial value in the English Market, I must confess at the offset that the circumstances under which the samples are shown prevent me from arriving at an estimate as to the true value of these products. The samples are too small to test the market, and the mode of package is unsuitable to a good class trade to which these goods are adaptative; but from the data before me I will offer these conclusions, the value of which must be left to your good judgment.

It must be borne in mind that although there is a demand for this class of products, that demand is governed by price. As the London market is the centre for all the world's products, these goods are naturally brought into competition with articles of a similar character, and the trade consequently goes to the best and cheapest producers. There can be no doubt that you are favourably situated for producing goods, such as I detail below, as well as any country. The fruits growing in great quantities, sugar being plentiful and labour cheap, consequently it only rests with the method of your packing so that the articles come into the market in a reliable form. For this purpose I should advise that, in each class of goods, a brand be established which will serve as a guide to reliability, which, for the successful purpose of trade, you must endeavour to impress upon your clients, must be always maintained, for goods varying in quality have a fluctuating value.

The following products come under my experience. I should be glad to open commercial relations with any of your clients and advise them on the methods of sending them to this market:

Cassareep, Limes, Papaws in Syrup, Tamarinds in Syrup, Guava Jelly, Limes in Syrup, Guavas in Syrup, Pine Apple Jams, Preserved Ginger and Tamarinds.

Cassareep. There is a demand for this as it is the basis of many sauces and condiments. I think a good trade could be made in this article. I should suggest that it be packed in open stone jars, well corked, containing about a gallon each, and made of uniform strength. If there is any difficulty in obtaining earthenware utensils I could ship to you proper jars for this purpose. I could then ascertain the London value for your product, for it is impossible to arrive at this in the absence of invoices from your side.

Tamarinds in Syrup. There is always a market for these in London; the mode of package is usually in small earthenware pots containing about half a pound of fruit and covered with a preserving paper; the sample you show is equal in quality to any in the market; they also might be packed in bulk.

Guava Jelly. The sample shown is very good and would command a good price if suitably put up.

Limes in Syrup. A very good sample is shown, but I think there is a little too much sugar used. I am certain business could be done in these as they are very scarce; if attention is given they will lead to success; great care should be taken that they are air-tight as they are so liable to evaporation. If these were sent in gallon jars they will pay for labelling and bottling here. I should suggest that this plan be adopted, but send sufficient quantities to show results.

Limes and Papaws in Syrup. The sample shown is very good; the same remarks apply to these as to the Limes in Syrup. Oranges in Syrup, these ought to be turned to advantage, they should be in a good clear syrup, not too sweet, and in glass jars containing about 2 lbs. of fruit. Care should be taken that the flavour of the orange should not be lost by too much sweetness; if they are carefully packed there is a certain market for them.

Pine Apple Jam. The sample is good, but unless you are prepared to compete in this product, I should not advise you to send, as great quantities come to this market from the Straits Settlements; and they are put up in a showy style and are sold very cheap.

Preserved Ginger. If this is preserved in Syrup as the Chinese pack it, there is a good sale for this article and it fetches good prices.

West Indian Pickles. If you can send these in bulk and the prices are low, they are saleable; but it would be necessary to bottle them afresh here, and price is the chief consideration.

Fruits. I am sure you have great facilities in your colony for bringing the fruits as cheaply to this market as any country. I am prepared to bring your products prominently to notice and would ask you to send me at your earliest convenience such samples that I may be prepared to offer them for sale and suggest improvements, if necessary; but again I have to draw your attention to bringing your consignments as cheaply as to be remunerative to you and establishing a firm trade in them. If there are any utensils that you consider necessary I shall be pleased to consign them to you, or any information I can get for you I shall be

yours to command. I may remark that there is a great demand for *crystallised fruit* here and with your cheap sugar and good fruit there is a splendid opening.

S. GOVER.

Extracts from Mr. Holmes's paper on some of the Drug Exhibits at the Colonial and Indian Exhibition :—

In the first place, the quality of the products exhibited indicated that the requirements of the London drug market are not well understood in the colonies. I say advisedly the London drug market, because it is generally acknowledged that London is the principal market for drugs in the world.

In the majority of cases drugs had been evidently collected with the least possible trouble and apparently in ignorance of the fact that the price realised will depend in great measure on the care bestowed in preparation for the market. Thus the bitter orange peel exhibited in the West Indian Court possessed neither the form nor colour required in the drug trade. Cinnamon was also shown, from several colonies, which would not compare in flavour or appearance with that from Ceylon, with which it must compete if it is grown for the drug or spice market. Beeswax affords another instance in point. Although it is easily clarified there was hardly a clean specimen of good colour to be seen in the Exhibition.

In the second place, it was noticeable that the best and most important of the drugs exhibited were those prepared either by colonists who combined pharmaceutical and chemical knowledge with operative skill, or by analytical chemists in the employ of the Colonial Governments.

Again it seems remarkable that a large number of colonial products which could be obtained in almost unlimited quantity, are practically unknown in commerce in this country. Thus the oil of the purging nut, and even the seed itself, does not appear to be known here, although about 300,000 bushels of the seed are annually sent from the Cape de Verde Islands to Portugal for the expression of the oil. Crab-nut oil, which thirty-five years ago was awarded a prize medal at the International Exhibition, and which could be procured in almost unlimited quantity from both British Guiana and West Africa, is not yet an imported article of trade in this country, and many other instances could be adduced. These facts suggest the importance to

the colonies of employing thoroughly competent chemists, possessing not merely a knowledge of applied chemistry, but a familiarity with the appearance and character of ordinary commercial products, whose business it should be to investigate and report on the native productions in such papers or publications as come under the cognisance of commercial men.

The lack of knowledge in the colonies of the requirements of the home markets, and the absence of information in this country concerning valuable colonial products, indicate the necessity for a central building in London and other large commercial towns where samples of colonial products, sufficiently large for examination and experiment, could be obtained, together with all published information concerning them. Such an institution, containing series of samples from different colonies, would prove doubly instructive: in the first place by showing whence the finest qualities of any product could be most easily and cheaply obtained; and, secondly, as an educational department in commercial knowledge for intending emigrants to the colonies.

The specimens of quassia exhibited in the Tobago and British Guiana Courts were derived from *Quassia amara*, and not from the official tree, *Picræna excelsa.*

Bitter orange peel, which was exhibited by several colonies, was badly dried, and consisted of quarter sections, instead of carefully dried strips of good colour as sold in this country.

Pomegranate bark was shown in the Jamaica Court, of a quality much superior to that ordinarily met with in commerce.

Several colonial remedies that have recently been introduced into Europe and America were shown in various Courts. The pretty scarlet and black seeds of *Abrus precatorius* formed a conspicuous object in several of the West Indian Courts, and also in that of British Guiana.

With respect to the non-official medicinal products of the Exhibition it is possible to regard them from two points of view: the one being that of Colonial Governments, which are naturally anxious to obtain indigenous substitutes of equal value for expensive drugs imported from the mother country; the other is that of the pharmacists of Europe and America who may be desirous of ascertaining if any of the colonial drugs possess medicinal properties which are worthy of careful investigation or are superior in quality or value to others at present in use. The latter point of view is the only

one which falls within my province, the former may safely be left to the medical profession in the colonies.

For ringworm, the seeds of *Vatairea guianensis* are made use of in British Guiana.

As a tonic in flatulent indigestion, boiari root seems to find general acceptance in British Guiana.

The following, from their poisonous properties, also seem worthy of chemical investigation: aramata, coroocoroo and moraballi bark, devildora root, haiari root *(Lonchocarpus densiflorus)* and the seeds of *Cacoucia coccinea.*

Excellent specimens of chillies were exhibited from Natal, and both chillies and capsicum in great variety in nearly all the West Indian Courts and in British Guiana; in the latter Court, Tonka beans, as fine as those of Para, were also shown.

In the Montserrat Court, the Montserrat Company exhibited a specimen of oil of lime leaves, which had a peculiar fragrance of its own, quite distinct from that of neroli. Apparently the only specimen of oil of bergamot in the Exhibition was shown by the same firm.

The principal official oils exhibited were castor oil and olive oil. The former was shown from nearly all the West Indian Courts, British Guiana, South Australia, Ceylon, Fiji, and the Seychelles, but only that from the last-named colony possessed the clearness and brilliancy to which we are accustomed in this country.

A large number of non-official oils were exhibited in the different Courts, some of them being obtainable in large quantities from more than one colony. This was the case with carapa or crab oil, which was shown in the British Guiana and Trinidad Courts, and is a product also of Western Africa. It has a bitter taste, and is used by the natives as an insecticide, a property which, if retained when the oil is saponified might be turned to useful account.

Numerous specimens of cocoanut oil were shown in several Courts that from Seychelles being very white, and a specimen in the British Guiana Court was not only very white, but unusually solid, and was pronounced by experts to be the best in the Exhibition.

Of those official in the British Pharmacopœia, copaiba was exhibited in the British Guiana Court. The specimens were of a pale colour and good consistence, but it is remarkable that it does not appear to be recognised as a commercial variety in this country.

A kind of elemi was shown in the British Guiana and West African

Courts, but in both cases of too hard a consistence to replace the Manila drug.

In the British Guiana Court there was a very hard resin, known as Demerara or Brazilian copal; of this there were two varieties, one pale in colour and evidently of more recent production than the other, which was harder and more yellow. This resin appears to be but little known in English commerce as yet, but I am informed that those who know how to dissolve it, find that it makes an excellent copal varnish.

A remarkable substance shown in the British Guiana Court, called karamani, is deserving of notice on account of its low melting point and its great tenacity. It appears to be a mixture of the yellowish resin known as hog gum, the product of *Moronobea coccinea* and beeswax, and may be compared to marine glue for its usefulness.

In the West Indian Court were two gums worthy of notice. One of these, the gum of the Cashew, *Anacardium occidentale*, dissolves but slowly, but makes an adhesive mucilage which is used in Jamaica as a substitute for gum arabic. It is obtainable in large quantities. The other was that described under the name of white cedar gum. It does not possess adhesiveness, but a small piece gives a thick mucilage with a large quantity of water, a quality which, if the gum proves to be harmless in character, might prove very useful for suspending powders in mixtures, or for sizing purposes.

There were doubtless many food products in the Exhibition, that might be employed either as diets for invalids or in the manufacture of palatable laxatives. I will only mention a few of them. Cassava root, dried and used like arrowroot, has already been experimented with in the National Training School for Cookery, at the request of Mr. G. H. Hawtayne, and the Lady Superintendent has reported very highly of its value as a variety for invalid or infant diet. Certain it is that the natives who feed on cassava rapidly put on fat. The curious preparation known as cassareep in British Guiana and the West Indian Islands also deserves notice as a harmless addition to food, possessing at the same time valuable antiseptic properties. Cassareep is prepared by evaporating the poisonous juice of the bitter cassava, which loses during evaporation the prussic acid it contains, as well as a volatile poison described by Dr. Peckolt (*Pharm. Journal.*, (3), xvii. p. 267) under the name of manihotoxin; but the antiseptic properties, due to a substance which Dr. Peckolt has named sepsicolytin, or fermentation hinderer, is retained in the cassareep. Albumen, to which a small quantity of

sepsicolytin had been added, is stated to have been kept without deterioration for six months. The value of a harmless antiseptic for preserving food can hardly be over-estimated. The advantages of cassareep as an adjuvant to diet are also worthy of investigation.

Meeting held 10th February.—Henry Kirke, M.A., B.C.L., President, in the chair.

There were 17 members present.

Elections.—*Members, Ordinary:* Rev. E. Pocknell, Chas. Mehler.

Member, Country: Frank Winter, Pln. *La Grange*

Associates: H. H. Bouglé, J. F. Whitehead, N. Cox, Junr., R. Fowler, J. A. Barclay, A. P. Eungblut, J. H. Greaves, J. A. Kendall.

The Secretary laid over the accounts presented by the Treasurer at the previous meeting, which had been duly audited by Messrs. J. S. Hill and D. C. Cameron. On the motion of the President, seconded by Mr. F. A. R. Winter, a vote of thanks was accorded to the Auditors; and the accounts were ordered to be placed on the minutes. In answer to Mr. Davis, the President stated that he could not undertake to place the accounts at the disposal of the press for publication in full, as it had not been done heretofore: the papers might, however, if they thought fit, give abstracts or total figures from the accounts. Mr. D. C. Cameron, Mr. Conyers and others having expressed themselves in favour of the fullest publicity being given to the statements of accounts, Mr. Geo. Garnett moved and Mr. M. Garnett seconded that the accounts be published in full in the current number of *Timehri*. This motion having been carried, the

President said it would be received as a recommendation to the Directors.*

The President then made a verbal report from the Directors as to the disposal of surplus funds, and concerning general business, as under :—

The Campbell Memorial bust had been successfully unveiled by Lady Irving the previous afternoon, and he had accepted on behalf of the Society the custody of the bust handed over by Mr. Imlach as representing the subscribers to the Memorial.

The Directors had asked Mr. Quelch to undertake the Editorship of *Timehri*, and he was happy to say Mr. Quelch had consented to do so. It was decided in future to devote one-half of the Magazine to the Society's Proceedings, to give fuller reports of the Society's meetings than had heretofore been the practice ; the other half would be devoted to original papers on scientific and general subjects of interest, and he expressed a hope that the many learned and distinguished members in the ranks of the Society would be ready to assist the Editor by furnishing papers for the Journal. With regard to the price, nothing definitely had been arranged yet, but, in the meantime, the price would remain the same.

The Curator had furnished the Directors with a long and exhaustive report on the Museum, which any member might see on application to the Secretary. The Directors had reserved a sum of $500 from the Society's surplus funds for general Museum purposes, but it was not intended to expend that money unless anything should arise which, in the opinion of the Directors, would justify the additional expenditure.

* See Statement of accounts on page 163.

From the surplus funds, the Directors had placed at the disposal of the Agricultural Committee a sum of $2,000, with a proviso that one half should be expended in experiments on a sufficiently large scale, on the growth and cultivation of fibres, to be carried out at the Botanic Gardens, where Mr. Jenman had kindly promised to lend his aid and co-operation. The other $1,000 was to be devoted to general agricultural purposes in experiments on soils and manures and other matters, as the Committee might think proper, such as was suggested at a recent General Meeting.

A further sum of $500 was set apart for improvements to the buildings, with reference to the entrance to the Reading-Rooms, strengthening the floors, &c., as might be found necessary after examination.

The President also reported that the Exhibits from the Colonial and Indian Exhibition had been returned to the colony, and, when opened up, would be distributed to the different owners on application at the Museum.

At Mr. Legge's request the motion standing in his name was postponed to the next General Meeting in April.

Mr. Darnell Davis enquired if any report had been received from the Agricultural Committee, or if any meeting of the Committee had been held.

Mr. D. C. Cameron, the Secretary to the Agricultural Committee, explained that since the appointment of the Committee, the weather had been so heavy that it was unreasonable to expect that the members, most of whom were planters, could be called away from urgent work on their estates, and therefore no meeting had been called. He hoped, however, before next month to get a meeting

STATEMENT OF RECEIPTS AND EXPENDITURE FOR THE YEAR *1886*.*

RECEIPTS.

Balance at credit of the Society with British Guiana Bank, 1st Jany., 1886			$ 782 25
Arrear Subscriptions—			
Ordinary Members ... ...$	652		
Country Members	306		
Associates	398	$1,356 00	
Subscriptions for 1886—			
Ordinary Members	1,953		
Country Members	773		
Associates	776	3,502 00	4,858 00
Catalogues Sold			12 96
Rents—			
General Post Office, 12 months to 30th September		1,200 00	
Pilot Committee " " ...		840 00	
Telegraph Office, 12 months to 31st December		300 00	2,340 00
Dividends from Hand-in-Hand In. Co.			
On $1,899 06 Scrip to 31st Decr., 1885, at 3 per cent.		52 22	
On $1,899 06 Scrip to 30th June, 1886, at 3¼ per cent.		61 72	
Cash Profit to 30th June, 1886, in lieu of Scrip		105 64	219 58
			$ 8,212 79

EXPENDITURE.

Insurances with Hand-in-Hand on Buildings, Books, Furniture, &c., $25,000, at 1¾ per cent...		$ 437 50
Repairs to Buildings		53 34
Subscriptions to Magazines, Papers, &c. from Baldwin & Co., to 30th September, 1886	773 70	
Subscriptions and Advertising in Argosy, Chronicle, Royal Gazette and Berbice Gazette	328 66	1,102 36
Purchase of Books—		
Remitted to W. Walker £100—	480 00	
Dictionary of Chemistry	35 00	
Lloyd's Register for 1887	16 80	
On account of Publication of "Timehri"	500 00	1,031 80
Salaries of Librarian, 1st and 2nd Assistants	1,680 00	
Expenses in connection with sale of Books	11 18	
Expenses of Box per Mail Steamers ...	58 00	
Petty Expenses	97 44	
Winding up Clock $12. Ice Can $11...	23 00	1,869 62
Balance at credit of the Society with British Guiana Bank per Pass Book		$ 3,718 17
		$ 8,212 79

Demerara, 31st December, 1886.

F. A. CONYERS, Acting Hon. Treasurer.

X 2

* Referred to on page 161.

of the Committee, when the various matters referred to them for consideration and report would be dealt with.

The letter from the Rev. W. H. Campbell, Rector of St. Michael's, on the subject of Arrowroot manufacture, was brought up for consideration,

The President said he was quite sure the members of the Society would be quite ready to extend not only their moral support as asked for, but also their practical help in forwarding Mr. Campbell's views.

The Rev. J. Foreman raised a question as to the right of outsiders writing direct to the Society, as he thought the practice might be abused by being made an advertising medium.

Mr. Davis suggested that Mr. Campbell might be asked to send a large sample of the Fleur de Lis brand, which with the consent of the Exchange Room Directors might be exhibited in a show bottle at the Exchange Room, where it would attract the attention of the Merchants, and so probably further Mr. Campbell's views.

Mr. Cameron mentioned that on his last visit to England he took with him samples of the Hopetown Arrowroot and had it valued and reported upon by brokers in London, where it was valued at 2⅛d. per lb. as against St. Vincent Arrowroot at 5¾d. He had also communicated to the growers recommendations from some of the brokers as to how the quality might be improved. Unfortunately the Arrowroot shipped from Demerara was frequently adulterated with flour and cassava starch, which told very much against the name of the products in the English markets. Mr. Cameron also mentioned that he had taken with him samples of plantain meal and sweet cassava meal, both of which

were thought very highly of in England, and a large corn flour firm was quite willing to take the matter up if sufficiently large quantities could be shipped and relied upon.

The Rev. J. Foreman as a former resident on the West Coast of Berbice gave his experience in the growth and shipment of Arrowroot. Some years ago as much as 900 to 1,000 barrels annually were shipped from the district. It was the matter of clear water for washing the starch that was the chief difficulty, as inferior water affected its colour, and that was the great objection to it in the London Market. In this respect the Islands, with their clear mountain streams, had the advantage over Demerara.

Mr. Watt suggested that the matter might more profitably be dealt with by the Agricultural Committee, who would doubtless report on the subject.

The following presentations were laid on the table :—

"Recollections of the Indo-Colonial Exhibition", from Mr. T. H. Glennie.

"Proceedings of the Royal Geographical Society for 1886", from Mr. W. F. Bridges, F.R.G.S.

"Diplomatic and Consular Assistance to British Trade Abroad"—Com. Reports No. 4779 (Pts. 1 & 2), from Board of Trade, 23rd August, 1886,—forwarded by direction of His Excellency the Governor.

The thanks of the Society were accorded for the same.

A letter was read from the Government Secretary's Office, dated 22nd January, 1887, No. 533, expressing a wish on the part of the Governor to receive from the Society any Communication on the subject of Commerce or Agriculture, which might seem adapted to the purpose

of the Board of Trade Journal, two copies of which were forwarded at the same time as specimen numbers. Ordered, the matter to be referred to the Committee of Correspondence, with a recommendation that they appoint a sub-Committee to draw up an Annual Report on the Trade, Commerce, and Agriculture of the colony for the purpose of the Board of Trade Journal.

The meeting then terminated.

Meeting held 10th March.—Henry Kirke, M.A., B.C.L., President, in the chair.

There were 14 members present.

Elections.—*Members*: A. Kingdon, H. P. Hodgkinson, and B. R. Clarke.

Associates: John Flett, John Logan, J. A. S. Quail, N. Chapman, E. G. Farnum, and Thomas Watson.

The Secretary read a circular from Mr. D. Morris of Kew, on Fruit shipments from the Colonies, accompanied with a set of questions asking for information on the subject of fruit supply in the colony. The Secretary explained that this circular had escaped attention at the previous meeting, being attached to other printed circulars from the Colonial Office, relating to the Board of Trade Journal, forwarded through the Government Secretary's Office.

Mr. Conyers gave his experience of successfully preserving for a considerable time specimens of cassava and plantains embedded in moist earth and sand.

Mr. Nind explained that this was a mode frequently adopted for preserving seeds and other botanical specimens for transmission to other countries; but feared

it would be difficult to get fruit successfully to Europe except in special cool chambers. As regards fruit shipments from this colony, he feared the great difficulty was in the supply, as practically little or no fruit was cultivated here which was a matter of regret.

The queries attached to Mr. Morris's circular were referred to the Agricultural Committee for replies.

The Secretary read a report from the Agricultural Committee on various matters referred to them for consideration.

Mr. Nind supplemented the report with some explanatory remarks; and the President stated that in a conversation with Mr. Jenman on the subject of setting apart a portion of the Botanic Gardens for the experimental cultivation of economic plants, that gentleman had expressed an opinion that many plants would not thrive well in the Botanic Gardens on account of their proximity to the sea-breezes, and suggested that the Society should acquire a piece of land up the river or on one of the Canals for the purpose of an Experimental Garden.

On the motion of Mr. Darnell Davis, the report was received and adopted, and referred to the Directors for them to give effect to the recommendations contained therein.

The Rev. J. Foreman gave notice of the following motion :—

To alter By-law, chap. xv., sect. 1, as follows :—after the words—"*when a motion is made for the alteration of existing by-laws, or the enactment of new ones,*" insert the following words, "*the by-law to be altered, and the proposed alteration therein, and the exact words of any proposed new by-law, shall be clearly specified in the notice of any such motion.*"

Mr. C. H. G. Legge handed in an amended notice of motion, as follows :—

That with the view of stimulating the individual efforts of members' and of ensuring more general co-operation for carrying out the objects of this Society, the following Rule be adopted—

"*Sub-Agricultural Committees of not less than two and not more than ten Ordinary members (of whom two shall form a quorum) shall be appointed by the Directors yearly in such districts of the colony as they may deem necessary, and such sub-Committees shall report to the Agricultural Committee at least once in every six months.*"

The President expressed a hope that any further amendments of, or additions to, the by-laws and rules would be made as early as possible, so that they might be embodied in the new edition of the Catalogue now in the Printer's hands.

The President moved a hearty vote of thanks to Messrs. G. H. Hawtayne and B. Howell Jones, Commissioners at the late Colonial Exhibition, for the efficient manner in which they had represented the colony, and the creditable way they had performed their duty, which deserved the thanks, not alone of the Society, but of the people of British Guiana generally. This motion having been carried by acclamation, the Secretary was directed to write to the two gentlemen referred to, asking them to attend the next meeting and afford the Society the benefit of their opinion as to the best mode of utilising the results of the exhibition to increase the usefulness of the Society for the advancement of the general industry of the colony.

Mr. J. J. Quelch, Curator, exhibited the following recent additions to the Museum, and made some remarks, explanatory and descriptive, of the various objects :—

1. A specimen of the Half-beak Gar-fish *(Hemirhamphus sp.)* in which the upper jaw is quite short, while the under jaw is produced to

form a long spine; presented by Mr. James Winter, from the Mazaruni River.

2. Two specimens of living "Frogfish" or tadpoles of *Pseudis paradoxus* from Leguan; presented by Mr. E. J. Cross.

3. A specimen of the Hacka-tiger *(Felis jaguarondi)*, from the estuary of the Essequebo river; presented by the Rev. W. Harper.

4. Specimens of Vanilla, prepared by the oven-process, from Mauritius; presented by Mr. G. H. Hawtayne, C.M.G.

5 & 6. A Locust screen from Cyprus; and a specimen of Crab-oil soap manufactured by Messrs. Field; presented by the same donor.

In addition to the above, the following had been presented:—

Two Water-crakes, from the Mazaruni; presented by Mr. James Winter.

A head of a Waterhaas, from Providence; presented by Mr. John Junor.

A Water-dog *(Lontra sp.)* and 3 snakes, from Cuming's Lodge; presented by Mr. J. Puddicombe.

A specimen of clay from the Calais-Dover tunnel, 2,200 yards from the English shore; 3 flint-implements from Gorlitz; one sugar-bag from Fiji; 3 Locusts from Cyprus; a large series of Museum preparations of beans, peas, oats and oatmeal, wheat and flour, barley, maize, starch, buckwheat and meal, from Canada; presented by Mr. G. H. Hawtayne, C.M.G.

The series of Guiana Insect homes which had been exhibited in the Colonial and Indian Exhibition—unfortunately much damaged in the outward passage; presented by Mr. Geo. Sanford.

The thanks of the Society were accorded to the various donors, and the Secretary was directed to communicate accordingly with Mr. Sanford in recognition of his interesting collection.

Extract letters were read from Mr. Wm. Walker, Resident Director in London, dated 29th December, 12th and 26th January, and 9th February, referring to the Society's Credit balance in London at 31st December, Ridgway's bankrupt estate, the Gold industry, and Arrowroot cultivation at Hopetown, Berbice.

Ordered to be taken for notification.

A petition was read from Christian J. and Isaac London, St. Michael's Parish, West Coast of Berbice, asking from the Society a loan of $300 to assist them in the erection of machinery for sugar making and arrowroot manufacture.

The Secretary was directed to reply to the petitioners stating that although the Society sympathized with their efforts, no funds were available for the purpose.

The thanks of the Society were accorded for the following presentations :—

Report of the Smithsonian Institution for 1884.

A large number of Indo-Colonial Exhibition catalogues, pamphlets, Colonial hand-books, &c., presented by Mr. G. H. Hawtayne, C.M.G. and the other Commissioners of the Indo-Colonial Exhibition, as per lists attached.

The meeting then terminated.

Circular, from Mr. D. Morris, of Kew, on fruit shipments from the Colonies, with appended questions on Colonial fruit trade :—

1. I have the honour to report, for the information of the Secretary of State for the Colonies, that considerable interest has been awakened in regard to Tropical and other fruits, by the display of fruits in the several Courts at the Colonial and Indian Exhibition ; and by the sale of fresh fruit in the Colonial Market attached to this Exhibition.

2. The fact that excellent fruits, such as oranges, lemons, pears, apples, &c., can be obtained in a fresh state from the Southern Hemisphere (Natal, Australia, &c.,) at a time when fruits of this kind are not obtainable in the Northern Hemisphere, has suggested the idea that the resources of our Colonial Possessions in this respect are capable of great expansion, and the subject one well worthy of being thoroughly investigated.

3. The abundant character and the high qualities of the Tropical fruits of the West Indies are well known; but it was only the other day (on the occasion of a lecture which I gave at the Colonial and Indian Exhibition) that many people realised that these fruits can be brought to England in a fresh state, and are capable of contributing largely to the food supply of the inhabitants of these Islands.

4. The fruit trade in the West India Islands is now of the estimated annual value of £750,000; but if suitable markets were forthcoming and knowledge enlarged on the subject, there is no reason why this trade should not assume such proportions as would go a good way towards relieving the depression under which these Islands are at present labouring.

5. As regards the actual capabilities in this direction of other portions of the Empire, and especially of the Cape and Australian Colonies, little is accurately known at home; and hence I would venture to suggest that inquiry be made and a summary of information published calculated to draw particular attention to the subject.

6. I enclose herewith a number of questions which I have submitted to Mr. Thiselton Dyer; and I am directed by him to convey his approval of them, and to suggest that a copy of these questions be forwarded to each of the Colonial Governments, with the request that the information desired be supplied as fully as possible, together with copies of any official reports, documents, or returns published in the Colonies directly or indirectly bearing on the subject.

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1. Please give a list (giving both local and scientific names) of the chief fruits grown in the colony, in order of importance.

2. During what months are the chief fruits obtainable? What quantities of each (approximately) are available for export, and what are the wholesale prices locally?

3. What fruits are at present exported (1) in a fresh or (2) in a preserved state? Please state the destination, the quantity, and the estimated value of each sort.

4. Are all or any of the fruits mentioned above capable of being produced in much larger quantities than at present? If so, what steps are necessary to start or develop a fruit trade; and what inducements, if any, do local men specially desire to open or extend a trade in fresh or preserved fruits, either with the mother country or neighbouring States?

5. What fruits are now imported into the colony, either fresh or preserved? Please state kind, quantity, and value, and the market from whence derived.

6. Please add any special points of interest connected with the fruits of the colony herein reported upon, which are desirable to place on record.

Report of the Agricultural Committee. The following matters were considered :—

1st. Letter from Mr. Hawtayne referring to tobacco and silk culture as possible industries for this colony.

It was agreed that the Society be recommended to approach the Government and ask that 25 acres of the Botanical Gardens be set apart and placed under the control of this Committee for the acclimatisation of various economical plants with the view of establishing some minor industries.

2nd. Letters of enquiry from Engineers and Inventors in the United States for information in regard to the $100,000 prize offered some years ago by the Government for mechanical aids for cane cultivation.

Recommended that the parties enquiring be informed that the vote of the Combined Court sanctioning the above named amount as a prize had lapsed.

3rd. Coffee and cocoa reports forwarded by Mr. Hawtayne on the samples exhibited at the Colonial and Indian Exhibition.

Recommended that the thanks of the Society be tendered to Mr. Hawtayne for obtaining and forwarding the reports.

4th. Reports and remarks forwarded by Mr. Hawtayne on pickles, preserves, &c., shipment of fruit, telegraph posts of colony wood &c.

Recommended that the information contained in these reports be afforded intending shippers on their applying for it.

5th. Letter from the Rector of St. Michael's Parish asking for the moral support of the Society in his efforts to establish the cultivation of arrowroot at Hopetown.

Recommended that the moral support of the Society be accorded to the reverend gentleman, but, in what manner, the Committee is unable to say.

The Committee accepts the two thousand dollars placed at its disposal for agricultural purposes, but with regard to that portion of it, one thousand dollars for cultivating fibres at the Botanical Gardens, the Committee beg to lay over from the Government Botanist, letter dated

4th March, 1887, and asks to be further instructed in the matter. The remaining one thousand dollars, the Committee have not yet decided how it should be spent, but have it under consideration.

List of Books and Pamphlets, presented by Mr. G. H. Hawtayne, C.M.G. :—

Handbook of British North Borneo; List and Description of Borneo Woods; Canada, its History, Productions, and Natural Resources; Official Catalogue of the Canadian Section; Notes on the Straits Settlements and Malay States; Catalogue of the Exhibits of the colony of the Cape of Good Hope; Notes on the Progress of New Zealand, 1864-1884; New Zealand Court, detailed Catalogue and Guide; Colonization Circular, New Zealand; New South Wales, Official Catalogue of the Exhibits from the Colony 1886; New South Wales, its Progress and Resources; Illustrated Handbook of Victoria, Australia; Catalogue of the Exhibits in the Queensland Court; Handbook of the Collection, illustrative of the wild Silks of India; Mauritius; Select Extra-Tropical Plants, by Baron Mueller; Agricultural Machinery, Orwell Works, Ipswich; Official Catalogue of Exhibits in Machinery Court; Catalogue Natal Contributions to Exhibition, 1886; Handbook to Cyprus, with Map of Island, &c.; Handbook to the West African Court, 1886; Remarks on the Caribs, by G. H. Hawtayne; St. Edmund's Bury, the Abbey Church and Monastery; Malta and its Industries; Official Handbook and Catalogue of the Ceylon Court.

List of Books and Pamphlets presented by the Commissioners of the Colonial and Indian Exhibition :—

Her Majesty's Colonies; Report of the Reception Committee, (6 copies); Official Catalogue; Official Guide; Report of the Commercial Conferences; Handbook of British North Borneo, (2 copies); Timber exhibited of British North Borneo, (2 copies); List and description of Borneo Woods; Catalogue and Handbook, West Indies and British Honduras; Catalogue of Exhibits in the Victorian Court; Official Catalogue, New South Wales; New South Wales, its progress, present condition and resources, (2 copies); Results of rain

and river observations made in N. S. Wales, 1885; Year Book of New South Wales, 1886; New South Wales, its progress and resources, second edition; How to settle on the land in the colony of Queensland, (2 copies); The Sugar Industry of Queensland; Contribution to Pharmacy from Queensland; A Popular Sketch of the Natural History of Queensland; The Flora of Queensland; Emigration to Queensland, or how to get to that colony; Queensland, An Introductory Essay; Education in Queensland; Agriculture in Queensland; Hints to Emigrants, essay upon bush-life in Queensland; Commerce and Industries of Queensland; Mineral Industries of Queensland; Handbook of Queensland Geology; Pastoral Industry in Queensland; South Australia, a sketch of its history and resources (2nd Edition); Some Notes on the Geology of Western Australia; Notes on the Aborigines of Western Australia, (2 copies); Notes on Western Australia, with statistics for the 1885, (2 copies); Catalogue of Exhibits in the Western Australian Court, (2 copies); Horticulture; Schools of Nova Scotia, Superintendent Annual Report; Nova Scotia, the crops, August 1886; Information for intending Emigrants to the Province of Nova Scotia; Information for Settlers; Educational System of the Province of Ontario; Prospectus of the School of Practical Science; Educational Exhibits of Quebec; Catalogue of School Appliances, Pupils' Work; Mémoire préparé par la section catholique du Bureau, &c.; By-laws of the Ontario Institution; Report of the Superintendent of Education for the Protestant Schools of Manitoba for the year ending 31st January 1886; Annual Report of the Department of Fisheries Dominion of Canada; Canada, its History, Productions, and Natural Resources; Official Catalogue of the Canadian Section; Descriptive Catalogue of Collection of the Economic Minerals of Canada; Puissance du Canada, Les Pêcheries du Canada; Le guide du Colon Français au Canada; Exposition Scolaire de la Province de Quebec, Canada; Across Canada, a Report on its Agricultural Resources; Canada at the Colonial and Indian Exhibition; Sport in the Canadian North-West; Canada, The Resources and future greatness of her Prairie Lands; Ontario as a home for the British Tenant Farmer, &c., (2 copies); Dominion of Canada, a guide book containing Information for Intending Settlers, with Illustrations; Canadian North-West and British Columbia, two Speeches by His Excellency The Marquis of Lansdowne; Canadian Forest-Trees, Timber, and Forest Products; Albany Settlement Qu' Appelle Valley, Canada N.W.T., Catalogue of Cana-

dian Pinnipedia, Cetacea, Fishes, &c.; Speech on Public Education in New Zealand; Handbook of New Zealand, with Maps and Plates, (3 copies); New Zealand Court; Catalogue of New Zealand Exhibits, (2 copies); New Zealand, a Field for Emigration; Appendix to the Statistics of New Zealand for the year 1884; Digest of Information on the Growth of Rhea, (2 doz. copies); On Rhea-Ramie—China Grass, (4 copies); Special Catalogue of Exhibits, by the Government of India and Private Exhibitors; Handbook to Fiji and Catalogue of the Exhibits; Newcastle upon Tyne, Mining, Engineering, and Industrial, &c.; West Shore; The Farmer's Advocate.

Meeting held 7th April.—Henry Kirke, M.A., B.C.L., President, in the Chair.

There were 17 members present.

Elections.—*Members*: Wm. Aitcheson, Rev. T. B. Angold, Rev. W. Lavender.

Associates: James Winter, W. S. Hunter, Kinsell Joseph, D. C. Fraser, E. A. Burgess.

Mr. B. Howell Jones, who regretted his absence from the previous meeting, asked permission to add a few remarks on the subject of fruit shipments. Soon after his first return to the colony, in conjunction with the late Mr. F. O. Luckie, Ice Contractor, he attempted to establish a trade in the shipment of limes from this colony to America, having a large number of full bearing lime trees at Pln. *Hope* on the East Coast. They tried experiments in the various modes suggested for packing the fruit, viz., wrapped in paper, in well ventilated barrels, in dry earth, salt, and sawdust, but by far the greatest measure of success was obtained by shipping them in old beer casks full of brine. However, the venture did not result in financial success, the net amount of profits

divided being only one cent. He was now prepared to place at the disposal of any member of the Society, free of cost, all the lime trees at Pln. *Hope* for the purpose of trying another experiment in the shipment of the fruit either to America or England, provided the member was prepared to pay the cost of picking and packing, and to place the result of the shipment before the Society for their information.

Mr. Hawtayne stated that large quantities of limes were now shipped from Montserrat by the mail steamers. They were packed in small boxes and reached London in good condition, where they were sold at the rate of about three dozen for half-a-crown.

The Rev. J. Foreman mentioned that he had bought limes in London for half that price, or at a half-penny each.

The President stated that at a recent meeting of the Directors the report of the Agricultural Committee was considered, and it was decided, in accordance with the recommendation of that Committee, to apply to the Government for a grant of 25 acres of the Botanic Gardens for the experimental cultivation of fibres and other economic plants.

The pavement surrounding the Society's premises had been renewed at a cost to the Society of about $360, including the cost of providing foundations for the contemplated extension of the building southward.

A new pedestal had been provided for the bust of the late Dr. Blair in the Reading-Rooms, uniform with that on which Mr. Campbell's memorial bust was placed.

The matter of *Timehri*, the Society's Journal, had been again before the Directors in connection with accounts

received from the publisher Mr. Thomson, to whom it appears a balance of over $1,050 is now due. Seeing that the Journal has cost the Society something like $300 a year after payment of subscription, the Directors felt anxious to obtain an expression of opinion from the members as to the continuance of the publication, and he would therefore be glad if at the proper time some gentleman present would give notice of motion on the subject to enable the matter to be discussed at the next meeting of the Society. In the meantime, the publication accounts were laid over for the information of members.

A letter was read from the Honorary Secretary to the Committee of Correspondence, stating that it was decided to postpone the preparation of an Annual Report on the Trade, Commerce and Agriculture of the colony, suitable for insertion in the Board of Trade Journal, until after the next meeting of the Combined Court in May, when the latest official returns would be available for the purposes of the report.

At the wish of the members present, the addresses of Messrs. Hawtayne and Howell Jones on the practical lessons of the late Indo-Colonial Exhibition, were postponed until the next month, when, it was hoped, there would be a fuller meeting—the early arrival of the mail preventing many persons from attending the present meeting.

Mr. Howell Jones gave notice of the following motion:—

That this Society continue the publication of *Timehri* on the same lines as heretofore.

Mr Legge moved the resolution, of which he had given notice at the previous meeting, in regard to the appointment of Agricultural District Sub-Committees, the object

of his motion being fully explained in the preamble. The appointment of District Sub-Committees, he thought, would be beneficial, affording country members who were unable to attend the Society's meetings an opportunity of promulgating their ideas.

Mr. Conyers seconded the motion for the sake of discussion.

The Secretary did not see the necessity for appointing such Sub-Committees, as at the election of the Agricultural Committee at the Anniversary Meeting in December, care was taken to select members residing in all parts of the colony, so as to ensure representatives in outlying districts to act in the manner suggested by Mr. Legge.

Mr. Jones opposed the motion on the ground of the difficulty of getting men together in the country districts to discuss business matters, his experience being that it was difficult even to get them together for social meetings. If members had anything interesting to report, it was an easy matter for them to direct the attention of the Society to the subject by means of a letter.

The Rev. John Foreman proposed as an amendment that the resolution be referred as a recommendation to the Agricultural Committee; but the amendment was not seconded.

Mr. Darnell Davis opposed the motion on somewhat similar grounds to those of Mr. Jones, and deprecated the absence of the agricultural element from most of the Society's meetings.

Mr. Legge having replied, the motion was put to the meeting and lost.

The Rev. John Foreman moved the resolution, of which

he had given notice, respecting the alteration of By-law Chap. xv, sect. 1., in reference to a more exact defining of any proposed alteration of the by-laws and rules, pointing out that previous motions had led to some unpleasantness in consequence of vagueness in defining the scope of the proposed alteration.

Mr. Drysdale seconded the motion, which was carried.

A letter was read from Mr. William Walker, Resident Director in London, dated 8th March.

Ordered—taken for notification.

The meeting then terminated.

Meeting held 5th May.—Henry Kirke, M.A., B.C.L., President, in the chair.

There were 32 members present.

Elections.—*Member :* Rev. Paul Ellis.

Associates : Wm. Alves, C. S. Birbeck.

The election of Mr. Jas. Perot was postponed under By-law Chap. vii., sect. 2.

The President explained the action of the Directors in reference to the recommendation of a general meeting, acting on a suggestion from the Agricultural Committee, that the Governor be asked to set apart 25 acres of the Botanic Gardens for the experimental cultivation of fibres and other economic plants. The Directors duly made this application to the Government, and in reply received a letter from the Government Secretary dated 19th April 1887, expressing an opinion from the Government Botanist that, partly in consequence of inadequate drainage and partly owing to periodical drought, the land at the Gardens is unsuitable for the experiments

proposed; and asking for an expression of opinion from the Society in regard to the establishing of an experimental garden somewhere up the Demerara River out of the influence of sea breezes, as recommended in the the report of the Government Botanist for 1885.

The President added that the Directors were of opinion that the funds of the Society available for the purpose were inadequate to carry out this proposal; but if the meeting thought the matter deserved further consideration the reply of the Government might be referred back to the Agricultural Committee to report upon.

Mr. Nind thought as the matter had already been before the Directors and the Agricultural Committee, it would be useless to refer it back again to the latter, and that it would be more practical now to take an expression of opinion from the general body of members. He considered the remarks of the Superintendent were a reflection on the Government after the expenditure of such a large sum on the Botanic Gardens. At the same time he believed that useful information might be obtained by the cultivation of the hardier economic plants at the Gardens, such as were capable of withstanding the adverse circumstances alluded to, and advocated the establishment of an acclimatisation Society for the objects aimed at.

In reply to a suggestion made by Mr. Winter, the President explained that a shelter belt had already been planted up to windward of the Botanic Gardens.

Mr. Hawtayne mentioned that, sometime ago, a proposal of the Directors of the Gardens for the encouragement of the growth of a better class of fruit and vege-

tables at the Botanic Gardens, was discouraged by the then acting Superintendent.

Mr. Howell Jones said the growth of economic plants was a subject that had long engaged his attention, and in order to give practical effect to the suggestion of the Government Botanist, he was prepared to hand over to the Society a certain number of acres of well-drained land on Pln. *Houston*, on any portion of the estate Mr. Jenman thought best suited for the purpose, at a merely nominal rent.

Mr. Nind having withdrawn his objection in presence of this new factor introduced by the liberal offer of Mr. Jones, it was decided to refer the matter, together with Mr. Jones's offer, for the further consideration of the Agricultural Committee.

The Treasurer laid over a summary of the financial position of the Society at 30th April, when there was a balance in hand of $3,905 85, since which the *Timehri* publication accounts, and others, had been paid, reducing the credit balance to $2,675 71.

Mr. B. Howell Jones moved the resolution of which he had given notice, that the publication of the Society's Journal, *Timehri*, be continued under the same name and upon the same lines as heretofore. Mr. L. M. Hill seconded the motion. Both members contended that the wide circulation the Journal had attained both in the colony and abroad, tended to extend the influence of the Society and its objects, and deprecated the alteration of its title which would interfere with its continuity as a Journal of the Proceedings; and the Honorary Secretary mentioned that he understood the former Editor, Mr. im Thurn, had practically withdrawn his objection to

the retention of the original title, which, at first, he had claimed as his own.

Mr. Hawtayne thought that the literary talents of the colony were overtaxed with two magazines to uphold, and advocated the discontinuance of *Timehri* in its present form, substituting for it the issue of occasional papers, containing reprints of any interesting papers read at the Society's meetings, and of the Proceedings generally.

The Rev. J. Foreman, referring to the large amount of arrears due for subscriptions to the Journal, thought that the "old lines" practically meant a free issue of the magazine to most of the so-called subscribers, and therefore suggested that it should be circulated amongst the members of the Society free of cost, if its publication was to be continued.

Mr. Nind supported the suggestion.

Archdeacon Austin supported the motion, believing that the publication of the Journal exerted a useful influence.

The President having explained that the object of the motion was to arrive at a definite expression of opinion from the general body of members as to the continuance of the publication, the directorate being itself divided in opinion on the matter, the resolution was put to the meeting and carried.

On the invitation of the President, the Commissioners at the late Indo-Colonial Exhibition, Messrs. Hawtayne and Jones, addressed the meeting at considerable length on the results of the Exhibition as regards this colony, and the practical lessons to be derived therefrom—Mr. Hawtayne confining his re-

marks principally to what might be termed the minor industries of the colony, and Mr. Jones to its staple products--Sugar and Rum.

A letter was read from the Secretary to the Council of the Meteorological Office dated 8th March, in reply to one from the Society in reference to meteorological observations, offering to obtain for the Society, at a trifle over contract prices, the necessary instruments. The Secretary was directed to enquire what the probable expenditure would be.

A letter was read from Mr. John McCarthy, Secretary to the Trinidad Agricultural Society, asking for a copy of the rules, &c., together with any recent publications of the Royal Agricultural and Commercial Society of British Guiana, in exchange for a quarterly Journal of the Trinidad Society which it was intended shortly to publish. The Secretary was directed to make the exchange asked for, by forwarding copies of *Timehri* to date, and a copy of the new catalogue of the Library with rules &c., when published.

The thanks of the Society were accorded to Mr. J. J. Quelch, for a copy of a book, of which he is the Author, entitled " Report on Reef-Corals," forming Part 46 of the Zoological Results of the voyage of H.M.S. Challenger; and to Mr. Ellis Barton for a copy of his " Table of Sugar memoranda with special reference to the Egestion process" as patented by him.

The Curator of the Museum, Mr. J. J. Quelch, exhibited the following recent additions to the Collection, and gave some explanatory remarks on each :—

1. A yellow-tailed Labarria snake *(Trigonocephalus sp.)*, from the Woods at Madony—a very rare form.

2. Skin of a Savannah-Deer *(Cariacus savannarum)* from Pln. Hope.

3. Guiana Silk-moth *(Attacus aurota)*, a series of specimens illustrating the life history from the egg to the imago.

4. Cocoa-nut root-boring Beetle *(Scarabæus sp.)* a series of specimens illustrating the life history of the form.

5. A female Scorpion, shewing the young attached to the back, as carried in early life.

6. A large, yellowish-green Caterpillar, with viperlike aspect.

The meeting then terminated.

Mr. Hawtayne's address to the meeting was as follows :—

I beg to thank you for the vote of thanks passed at a former meeting to my colleague Mr. Jones and myself. For my own part I can only say that I greatly appreciated the honour conferred on me, by the appointment as Executive Commissioner, and that I found much pleasure in doing my best for this important and interesting colony, and I am sure that we, your Commissioners, did all we could to bring British Guiana and its products into notice. Of course, there have been criticisms on the appearance of the British Guiana Court, the arrangement of its contents, and other matters, but while sensible that more might have been done under other circumstances, I would remark, that the chief products of this colony are more interesting than beautiful, and that it is hardly fair to draw comparisons between our exhibition of sugars, timbers, barks and fibres, and the brilliant art productions of India, Cyprus, and Malta, or the multiform products and manufactures of Canada and Australia.

On the other hand, His Royal Highness, the Executive President, our friendly rivals the Commissioners of other colonies, the press, and the throng of visitors of all classes from Royalty down, who more or less minutely inspected the British Guiana Exhibits, have been most liberal in their commendations, and now your recognition of our exertions, the only one of an official nature we have as yet received in the colony, is most acceptable, and goes far towards rewarding us for our anxiety, trouble and outlay.

It may be interesting to state that the accounts of the Exhibition were submitted for audit soon after my return, and that the cost of representing the colony has been about a Thousand dollars less than the sum voted.

A considerable number of exhibits bought for the Exhibition have been left for the Imperial Institute, which otherwise would have been sold, and the proceeds added to this balance; and all the glass vessels and many of the fittings have been sent out to the Society.

With regard to beneficial results to this colony, I may say in the first place that the existence of the colony of British Guiana was by means of the Exhibition made known to thousands who had never heard of it before, and its products brought to the notice of thousands more, to whom it had been merely a geographical expression, a "place on the map."

The British Guiana Court was an object of interest to all, and was honoured on several occasions by the visits of Her Majesty, who desired that a description of those exhibits from the colony which had attracted her notice might be furnished her, and I may here mention that I have received through Sir P. Owen, the Secretary of the Royal Commission, an expression of Her Majesty's "thanks for the interesting Handbook and Catalogue of British Guiana which the Queen has been graciously pleased to accept".

Of specimens of articles in general use our cane products were the chief. Demerara crystals, as you have heard were given away and sold in small packages to the extent of about 30 bags, and were thus largely advertised. I was assured that the dealers who undertook to retail pure Demerara and West Indian cane sugar in quantities of 12 lbs. and upwards, and to whom purchasers were referred, disposed of very considerable quantities, and that the demand for Demerara sugar had been greatly stimulated by its having been made known by the above means.

I may add that the comparisons drawn between the quality of our sugar as obtained in the British Guiana Court and Market, and that bought in the shops were always in favour of the former, and I have no doubt that it would be beneficial to grower and consumer if the latter could procure small parcels of Demerara crystals direct from the factory.

But on the subject of cane products, Mr. Howell Jones will no doubt address you and with more authority than any words of mine possess; but before quitting the subject, I must mention the case of one old lady who eyed our bottles of white and coloured rum very attentively, and was kind enough to compliment me in my capacity of Showman on having "bleached some of 'em so nicely, it must have taken sich a lot of trouble".

The Coffee and Cocoa shewn met with high commendation and the

reports which I was enabled to procure for the Society ought to be most encouraging.

The samples of timbers attracted much notice, and were the subject of much enquiry; those lent from the Museum of Science and Art in Edinburgh which had appeared in the Forestry Exhibition, had, however, deteriorated a good deal. They were split and looked insignificant. Some of the slabs exhibited by this Society were also in indifferent order. They were polished and made to assume as good an appearance as possible, still, splits in them detracted from their value in the eyes of experts. Probably in collecting future specimens it will be desirable to take more time and to exercise more care in the felling of the trees, using the saw rather than the axe.

The smaller blocks shewn by Messrs. Park & Cunningham were in excellent condition and formed an attractive exhibition.

All these exhibits were brought to the notice of furniture makers, carriage builders, railway companies—the authorities at Woolwich and at the Small Arms Factory at Endfield. Mr. Lastell, the expert selected by H.R.H. the Executive President to report on the timbers in the Exhibition, expressed himself very favourably with regard to them. I wish to mention that I had hoped to have laid before you the official reports on the several exhibits, but they had not reached me by the last mail.

I regret that experiments were not made upon our woods by Messrs. Ransome who invited the Commissioners of the several colonies to submit their timbers for trial at their Works, but the sizes required were beyond what could be supplied and there were no specimens available.

The railway sleepers, although approved of, could hardly compete with those of fir which are generally used in the United Kingdom—the latter being so much cheaper even when kyanised or otherwise protected against rot, while these are likely to be supplemented for reasons of economy by sleepers of steel.

The telegraph posts of wallaba attracted some attention, and were considered to be worth while trying.

One very interesting display in the South Australian Court was the collection of specimen cards shewing various woods in bark and in vertical and transverse sections with the foliage and inflorescence. I believe I am right in saying that many of our woods have not as yet been classified botanically, and it is desirable that this omission be

supplied, and collections of preparations similar to those of South Australia formed for exhibition in our Museum and for exchange with other Institutions. Walking sticks are largely imported into the United Kingdom from all parts and those shewn in the British Guiana Court met with a ready sale, especially those of Letter Wood. I had the pleasure of going over the warehouse and factory of Mr. Howell of Old Street, London, one of the largest importers and manufacturers. It is unnecessary for me now to describe the extraordinary varieties and number of sticks there collected, as the *Royal Gazette*, a few days ago, published a reprint of an article from the *Gardener's Chronicle* on the subject with hints for selecting raw sticks, There is a large supply of stick materials in this colony which might readily become an export of considerable value—and I recommend persons who see their way to collecting them, to send to Mr. Howell samples of what they can supply.

The fibres which were arranged by Mr. Rodway, have been all carefully examined—not only by Mr. Cross whose report, it is hoped, will soon be available, but by Dr. Watt whose works on the economic products of the East Indies are well known. From what I could learn there were *no* fibres grown by this colony of greater value than those already known, and that in the whole Exhibition there were only two which could be considered as valuable novelties. This has been already mentioned in communications made by me to the Society, and although some of the British Guiana fibres are of recognised value, and samples have been priced at remunerative figures, success depends on a constant reliable supply--and before fibre culture or collection is undertaken a careful consideration of the opinions of experts like Mr. Cross is, I think, very advisable. Mr. Cross sent me an interesting specimen of paper stuff from the edible banana which was given to the Society. Further particulars, when forthcoming, will be laid before you.

The gums were objects of much attention. Locust gum besides being very soluble in eucalyptus oil, and valuable as a varnish, was shewn to be capable of manufacture into an article closely resembling amber, and then mixed with that substance it formed a material available for mouth pieces of pipes &c. Hyawa appeared to be little known, indeed I was unable to sell the specimens which remained after the Exhibition on that account.

Balata was shown in various forms, and many persons who enquired about it were referred to Mr. H. K. Davson who kindly contributed the

most attractive specimens. The india rubber from the *Hevea Guianensis* was new to the London Market, and, it was believed, would command a ready sale at 2s. per lb.

The oils will be fully reported on by my friend Mr. Leopold Field, who has experimented upon the Carapa or Crab oil. Some soap made from it by him has been laid before the members of the Society.

The cocoa nut oil was much admired, and one Guiana specimen declared to be the best in the whole Exhibition.

With regard to these and other products much valuable information will be afforded by the official reports before alluded to. There is no doubt that attention was largely drawn to these articles by means of the Exhibition, and if greater facilities were now afforded for obtaining samples for experiment and information respecting them, a demand would spring up.

The Pharmaceutical Society through its energetic Curator, Mr. Holmes, has made and is still making researches as to the value and utility of many of our products, and applications were constantly received from Chemists and Pharmacists in London and the Continent for samples, &c. I cannot help thinking that if the colony were represented in London by an agent who would be the medium of communication between the growers or collectors on this side, and consumers on the other, a trade would be fostered in many products which now are valueless because unknown and unappreciated.

One result of the exhibition was to shew that the fruit trade of this colony is capable of successful development. A large quantity of bananas and other fruit from Demerara imported by Messrs. Scrutton, was sold by the Commissioners and if the supply had continued in good order a larger quantity could have been disposed of. As it was, one day nearly £14 worth was sold in pennyworths. It is true that a young man from the country, who informed me that he had been drinking " Lager beer and didn't think much on it," was induced to buy a banana, but after eating half, declared that " banana were not ahead of lager beer," but notwithstanding this adverse criticism it is a fact that the taste for this fruit is increasing, and all that appears to be wanted is care in picking and packing, and a mode of transport adopted, which, while arresting ripening, does not injure the fruit by excessive cold. Fruit from Australia was brought to the London market in excellent condition; avocado pears, a very tender fruit, sugar and custard apples from Madeira or the Azores

are to be bought in the first class fruit-shops in London, and there appears to be no reason why British Guiana should not contribute to the markets in London and New York. Mr. D. Morris of Kew has recently read before the Royal Colonial Institute an interesting paper on fruit, and I am informed on excellent authority that there are capitalists in New York ready and willing to assist in creating a banana trade between our colony and the United States.

I have already reported to this Society on the subject of cassava, the dried slices of which root were highly appreciated by those by whom they were examined and tested, but as far as can be ascertained no one has since endeavoured to send any to England, which, I confess, is very disheartening,

Jellies and pickles, or vegetables for pickling exported in brine, will, as it appears from Mr. Gover's paper forwarded to the Society, command a sale. In those matters neatness of package and greater care in preparation are needed. Jelly made any how and put in any kind of bottle is not likely to sell. Here again is an industry which small land owners or occupiers might well cultivate, and which commends itself to an unfortunately large class in the colony who are unequal to the exertion or exposure which the usual agricultural pursuits require.

There were only one or two specimens of honey from this colony and these were of fair quality. It is to be regretted that bee-keeping is not carried on here, as it might easily be, with the same success as in Jamaica and elsewhere. It is a pursuit which requires no great expense, no costly plant, only patient careful attention.

One of the most interesting collections in the Exhibition was that of silk. Specimens of the fibre from every variety of silk producing moth was shown, and Mr. Wardle, under whose charge that portion of the Exhibition was, took much interest in the Guianese moths which appear to him to be capable of producing silk of good merchantable quality. I have sent Mr. Wardle specimens from here and his report will be of much interest because, if there is any room for encouragement, silk raising might become another small industry capable of great results, especially as many plants yielding food to silk worms are indigenous to the colony. This is not the time to dwell on the feasibility of such undertakings, but I have thought it right to point out that the Exhibition contained many encouraging results of the successful prosecution of such industries elsewhere, which industries might well take root

and flourish here if only the necessary energy and perseverance be forthcoming.

I may not, however, detain you longer—I would only express my belief that there has resulted from the Exhibition a more intimate knowledge and appreciation of our products which if kept alive *must* tend to the benefit of our agricultural and commercial interests. Exhibiting, it must be remembered, is but another name for advertising. It is, however, of no use to advertise unless one is prepared to do business. Samples are less than useless if the stock they are supposed to represent does not exist. It is therefore idle to flatter ourselves that we have done all that is necessary by merely sending articles to an Exhibition like that of last year. Good was done by shewing our products and giving information about them, but more is wanted. Our products must be constantly and persistently brought to the notice of the public at home, and producers must be prepared to quote prices and undertake prompt and regular supply. To encourage the profitable production of already known articles of commerce, and to help in creating or in assisting every industry which holds out a prospect of success, is the chief object of the Royal Agricultural and Commercial Society, and it is hoped that it will shew that it recognises this by doing all in its power to bring about real and practical improvements in all branches of our commercial and agricultural industries.

I beg again to thank you for your kind acknowledgment of whatever services Mr. Howell Jones and I have been able to render to the colony and the interests you represent.

Mr. Howell Jones then addressed the meeting, and said :—

Mr. Hawtayne had read such a long and interesting paper, that he would address the meeting more particularly with respect to the department which more interested him, than others, in consequence of his connection therewith. He referred to the sugar question. He made a very careful examination of the Courts in which sugar was exhibited, and he could safely say that the exhibits from this colony were in every respect far superior to any other. There were some, however, especially from the Island of Trinidad which very nearly approached the exhibits sent from this colony, and it could be said that Trinidad had now become one of their rivals in the manufacture of the product to a very great extent. He had also endeavoured to interest those connected with refineries with the value of dark crystals for

refining purposes, and he believed a very favourable impression had been made with respect to them. With reference to the finest exhibition sugar, he said it might surprise some to hear that the finest sugar came from the North West Provinces of India. These exhibited a fine clear sugar of high polarisation, most tastefully and fancifully put up. Of course these exhibits must have cost a considerable sum of money, and it would not do for them as exhibitors to shew such specimens in the way that the sugar refiners of the North West Provinces set theirs out. Mr. Jones proceeded to state the form in which these exhibits were shown, and added that with great facility persons were afforded an opportunity to see exactly the size of the sugar exhibited. He was also struck with the great strides that had been made in Barbados, and it was also most curious to note the great change that took place in the sugar from that island after exposure to light and air for a few days. It would be hardly fair to make comparison between the sugar sent from this colony and that from Mauritius, which although they were smaller grains than ours, did not show that bright sparkling look that white sugars had here, but a dull grain which seemed an attempt to approach yellow. That class of sugar was not made here, nor would there be any demand for it if it were imported to American or English Markets, therefore, it would not be fair to compare them with the sugars of this colony. The sugar from New South Wales was very handsomely done and well put out, however a great number of the exhibits were considerably spoiled before the exhibition was over. The sugars that attracted considerable attention and required some consideration were those from Fiji, and amongst those were exhibits from a Company which showed both white and yellow samples, and very much larger grains than we made here. They were not put in good position however, as regards light. In mentioning these sugars he desired to call the attention of members of the Society to the package in which they were put up. They were put in mats of very good construction, almost water tight, and much better than the ordinary bag imported for use in this colony. When the sugar was emptied out, these mats were perfectly dry. Mr. Hawtayne obtained one of the mats which he brought out with him (the mat was shown to members) with the object of ascertaining whether they could be made in this colony.* He next

* This sugar-bag is exhibited in the British Guiana Museum.—ED.

referred to what he considered was a mistake made by them here in showing sugars in glass bottles. He thought the exhibits should be shown in such a way that they could be renewed from day to day, because they deteriorated very much from exposure to light and air. He also recommended that in future when exhibits were sent away, a more simple method than that which was at present followed should be adopted. He had endeavoured to ascertain by observation the best way to send home sugar, and he found that the best method would be to place the sugar in a cotton cloth bag, then a coarse bag, and then to drop that bag into a box, the cover of which should be secured with ordinary nails and not screws, as was at present done, so that the contents could be got at easily, and the samples renewed from time to time. With reference to fibres, he observed that with the exception of one person, nobody sent a single exhibit of fibre from this colony, and everything that was required had to be bought at a very high rate and at much expense. This showed how little interest was taken here by people in sending home exhibits. He was disappointed in respect to some of the values; there were a great many of very small value, and a few of great value, and he therefore considered it depended upon the preparation and manufacture of the article for it to become a good export, and unless one had a large quantity of fibre, it would not pay to take it up. He thought the Exhibition had done, indirectly, an enormous amount of good. It brought British Guiana very much more to the fore than hitherto, and to the knowledge of persons who previously had no more than a geographical knowledge of the colony. The exhibits had been shown in a very creditable manner, and they had brought to knowledge the numerous products that this colony could present to the world. He felt sure, that although perhaps we might not feel the effect at the present day, perhaps a short time hence there would be enquiries for fibres, gums, oils, and drugs for which there had been no enquiries before. He fully endorsed Mr. Hawtayne's recognition of the kind manner in which the Society had passed a vote of thanks to Mr. Hawtayne and himself.

Meeting held 16th June.—Henry Kirke, M.A., B.C.L., President, in the chair.

There were 16 members present.

Elections.—*Members :* Julius W. Conrad, E. L. Max, H. D. Seedorf, Wm. Price Abell.

Associates: W. A. Harrison, J. E. Strickland.

In answer to a letter of enquiry addressed to the Treasurer by the Rev. John Foreman, the President explained that the balance of $3,718 17, mentioned in the last financial statement, included the $2,000, placed at the disposal of the Agricultural Committee, but which had not been drawn.

The President stated that the Directors at their last meeting had under consideration arrears of subscriptions due from members and associates. He was glad to learn from the Treasurer that several subscriptions had since then been paid in; and he wished now to intimate that the Directors had decided, in order to carry out the rules of the Society, that all members and associates in arrears of subscription at 30th June be struck off the roll.

Mr. Hawtayne gave notice that, at the next meeting, he would move that it was desirable that lectures be given in the institution by members and their friends.

The President stated that, at the next meeting, he would ask the members to decide whether or not the Reading-Rooms should continue to be opened in the evenings. The Directors, in response to the wishes of the members had now continued the experiment from the 1st February; but he was sorry to say the very small average attendance did not seem to warrant the extra expense incurred in lighting and attendance.

A letter was read from Mr. John Minty of Pln. *Uitvlugt*, stating that, at the request of Mr. Russell, he had planted several parcels of rice received from Calcutta

through Mr. Robert Mitchell ; and he promised to communicate further on the subject when the crop was reaped, about September.

The Secretary was directed to convey the thanks of the Society to Mr. Minty, for his attention.

A letter was read from Mr. B. M. Whithard of Colon, asking for information as to the cost of fitting out a gold prospecting expedition, and various particulars as to the success and prospects of the gold industry in the colony.

It was ordered that the letter be taken for notification, the Society not being in a position to supply the information asked for.

A letter was read from Dr. W. Sieglin, Secretary to the Geographical Society of Leipsic, forwarding two copies of their Proceedings, and asking in exchange the Society's publication.

The Secretary was directed to place the Geographical Society of Leipsic on the *Timehri* free list, and to convey the thanks of the Society for the Proceedings forwarded.

Mr. J. J. Quelch, Curator, exhibited the following Museum specimens, and made descriptive and explanatory remarks on them :—

1. Specimens of native otters, and one European otter (*Lutra vulgaris*) for comparison with them. The native specimens were shown to belong to three different species, namely, *Pteronura sandbachii, Lontra brasiliensis*, and *Lutra macrodus*, the two latter species being also natives of Brazil.

2. Specimens of the Pompadour Cotinga *(Xipholena pompadora)*, the Purple-breasted Cotinga *(Cotinga cœrulea)*, and the Purple-throated Cotinga *(Cotinga cayana)*, all from the Essequebo river. Two specimens of each were exhibited, one in natural plumage, while the other shewed the purple feathers changed into a lively red, as the result of the application of heat by the bird-stuffer, who thus secures an apparently different bird of bright plumage.

3. Specimen of the Salempenta from the Botanic Gardens, sent by Mr. Jenman; also Salempenta's eggs.

4. A series of specimens of the elongated Land-snails *(Bulimus)*, shewing the eggs, the young shells, and the full-grown form.

Several members remarked that the specimens of native otters exhibited were very poor; and the Curator expressed a wish that the members would assist him in procuring better specimens for the Museum.

Mr. Howell Jones stated that his offer to any member of the Society to take over his lime-trees at Plantation *Hope* free of cost, for the purpose of trying an experiment in shipping the fruit, not having been accepted, he had accepted an offer from Mr. J. T. Law towards that object, and he promised to publish the results of the experiment when ascertained.

In connection with the possibility of establishing a fruit trade from this colony, Mr. Jones mentioned that on the last trip of the *Nonpareil*, 1,000 bunches of bananas had been purchased by Capt. Boniface from Pln. *Houston* for $160. He understood there was a considerable demand for bananas in America.

Mr. Hawtayne remarked that the price quoted by Mr. Jones, 16c. per bunch, left a very good margin for profit to the shippers, as he remembered that at the Colonial Exhibition, they were charged something like six shillings per bunch for bananas from a shipment by the same steamer.

The President mentioned that he learnt from the newspapers that bananas were very dear at present in New York, in consequence of the failure of the crop at the Bahamas.

The meeting then terminated.

ERRATA.

On page 71, line 31, for 74 read 73
" " 99, " 31, for moments read movements
" " 115, " 22, " are " is
" " 128, " 6, " have " has
" " 131, " 20, " proves " prove.

Kyke-over-all, referred to on page 87, line 10, is situated at the junc-
on of the Mazaruni and Cuyuni.

TIMEHRI:

BEING

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OF

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*A visit to the British Guiana Museum.**

By the Editor.

AS a prefatory notice it might be remarked that the collections representative of the colony are incomplete and unsatisfactory. That goes without saying in such a colony as British Guiana, where from the nature of the country and from life conditions generally, constant difficulty is experienced in collecting desirable objects, in preserving them, and in rendering them available for general information; and where the Museum, of but recent formation, has filled the double office of a colonial Museum proper, and of a sort of storehouse from which to draw objects for extra-colonial Exhibitions.

Since its formation, moreover, the Museum, as regards its representative character, has unavoidably suffered

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* Until it has been possible to carry out the contemplated re-arrangement of the Collections, it will be inadvisable to issue a guide to the Museum, however desirable such a guide may be for ordinary visitors. A catalogue, of any real value, it will be impossible to publish until a careful revision has been made of very many of the named specimens, and until determinations have been completed of the large number of unidentified objects—matters, which, in both cases, present considerable difficulty, and require a considerable amount of time. Besides this, a catalogue in spite of its high-sounding title, is practically destitute of interest for visitors to a Museum, and is of use chiefly in exchanges with, and presentations to, other Institutions and Societies, for which purposes scientific accuracy is the first essential in its preparation, and indeed the only justification for its publication. Under these circumstances, the following discursive general account of a visit to the Museum, will, it is hoped, serve as a temporary guide, directing attention to some of the more interesting objects to be seen.

through a frequent change of curators, owing to the fact that, in such a colony as this, each new curator has, at first, to become familiarised with local conditions of very varied character before being able to devote his full force to the development of the Museum.

The general, as opposed to a colonial, collection is simply fragmentary. This needs no other explanation than the obvious one, that the colonial Museum aims chiefly at a development of the colonial collections. This partial aim is a necessity for the Museum under present circumstances. Still, incomplete as are the colonial collections, and fragmentary the general collection, a very considerable and interesting exhibition, presenting a high degree of variety, is made—a variety which, for the least intelligent visitor, ought to relieve an inspection from any taint of dulness, since, after all, variety is charming.

The visitor, after ascending the stairs leading to the Museum, finds himself on a landing where the specimens exhibited will fully repay inspection.

On the left, as though guarding the approach to the Library (where there is no right of way to visitors), stand the two most expensive specimens in the Museum collection, namely, the African Lion (*Felis leo*), and the Royal Tiger (*Felis tigris*) of India—the two largest of the tribe of cats. The specimens are extremely fine ones, the mounting of the lion being particularly worthy of mention. These animals are so well known, that no special notes about them are required. The mane, which adds so much to the majestic presence of the "King of Beasts", the tuft of hair at the end of the tail, and the

uniformly yellow-brown short hair are the distinguishing characteristics of the lion. In the young, however, these characters are much less marked, and a closer approach is made to the other cats, for the mane is not developed until from the third to the sixth year, while the skin is distinctly barred or striped. The cross bars or stripes of the tiger are characteristic; and the white spot or patch on the back of the ear recalls a corresponding feature in the Ocelot or Labba-tiger (*Felis pardalis*) of the colony. Modern observation goes to prove that the tiger exceeds the lion in size, audacity and activity; it is, however, somewhat more slender in build, and hence inferior in strength. The tiger frequents the jungles of the Asiatic continent, and the Malay Islands, especially in the neighbourhood of streams; while the lion is specially characteristic of the African plains, ranging, however, to Arabia, Persia and India. The duration of life in both species seems to be from thirty to forty years. An accidental and misleading feature in the tiger exhibited is the presence of five small incisor teeth between the two immense canine teeth in the upper jaw; there should be six incisor teeth, a number characteristic of the order *Carnivora*, or flesh-eaters, to which the various forms of cats, dogs and bears belong.

On the railing, close to the lion and tiger cases, are shewn for comparison with the two largest of the Old World cats, two skins of the largest American cat, the Jaguar or colonial "Tiger" (*Felis onca*). No mounted specimen of this cat is to be found in the Museum, the skins hitherto obtainable being unsuitable for the purpose. The two specimens exhibited, both obtained in the Pomeroon district, contrast markedly with the lion and

tiger, and present the two extremes met with in this variable species. The larger skin nearly five feet in length, exclusive of the tail, represents the ordinary form, having a greyish or reddish-brown ground colour, thickly marked with dark reddish-brown or black spots in more or less distinct longitudinal lines along the upper part of the body. The spots, however, instead of being always uniformly simple, are arranged to form triangles, circles and rosettes, especially along the sides, while the presence of a distinct spot in the centre of the figures is a marked characteristic of the species. The smaller dark skin represents the melanic variety of the jaguar, a variety known in the colony as the Black or Maipurie Tiger, one formerly described as a distinct species under the name of *Felis nigra*, and commonly bearing the reputation of being fiercer than the ordinary form, though inferior in size. The jaguar is proportionally about as massive in build as the tiger or lion, with very short and stout limbs, adapted to an arboreal mode of life, unlike the lion and tiger which are unable to climb trees. The allied ocelot and other " tiger cats" will be seen inside the Museum proper in glass cases, to which reference will be made later.

On the top of the lion and tiger cases, is seen a medium-sized specimen of a Shark *(Carcharias sp.,)* about seven feet in length, caught in the Demerara river off the market. Some of the characteristics of the Shark group are very peculiar, and separate it widely from the other orders of Fishes. Thus the *skin* instead of being made up of scales or bony plates, consists of closely-packed grains, tubercles or spines, which in the sharks proper yield the " shagreen" of commerce. The

gills instead of being, as in ordinary fishes, movable, closely gathered and covered by a movable flap loose behind to allow of the escape of the water taken in at the mouth for respiration, are fixed in pouches which open separately to the exterior on each side behind the head, being usually five, though occasionally six or seven in number. The elongated body, the well-developed snout with the mouth placed well on the under side, and the strong tail forming a prolonged upper lobe, are other special features of the sharks. These sea-monsters have been obtained more than thirty feet in length.

In front are seen two colonial Tortoises. The smaller specimen is a very large form of the common Land Tortoise ; while the larger specimen is a River Tortoise (*Podocnemis expansa*), which had evidently reached a good age, evidenced by the deep concavity along the middle of the back—in the young state, the back is markedly convex. The limbs of the River Tortoises, though modified for swimming, are not converted into perfect fins, and they still retain distinctly visible webbed digits (with long nails) which are not noticeable in the perfect fins of the marine forms or Turtles. The toothless, horny, beaklike jaws of this order (*Chelonia*) are peculiar among the class of Reptiles, as is also the hard bony box, enclosing the body, and made up of plates developed in the skin and fused with the expanded ribs and backbone of the true skeleton within. The Tortoise-shell of commerce is derived from the outer plates of this box in the Hawk's-bill Turtle. Existing Tortoises are but pigmies when compared with extinct forms, one of which, discovered in India, apparently attained a length of about twenty feet.

Above the Tortoises is seen the head of the colonial "Waterhaas" or Capybara (*Hydrochœrus capybara*), a large semi-aquatic animal belonging to the same order (*Rodentia*) as the rat, rabbit and labba. It is the largest of the rodents, and may be described as being a gigantic guinea-pig—attaining a length of about four feet. The head is the only portion of the animal in the Museum. A picture of the beast is given on the adjacent chart of animals.

On the right is the entrance to the Museum proper. Over the doorway hangs an old oil painting representing a scene in the interior. The scene is one of extreme beauty; and though no information is attached to the painting, it was evidently the work of some one possessed of considerable artistic ability and gifted with high poetic feeling. The contrast presented by the Indians in the painting is, moreover, a very interesting one. In the foreground, on the right, is a picture of industry, the Indian at his "dug-out"; behind, Indians in their hammock enjoying the *dolce far niente;* while on the left, apart, sits a solitary individual, looking the picture of misery, as though he had eaten food or drunk paiwarrie *ad nauseam*, and was suffering accordingly. The costumes seem to denote that civilisation had already considerably modified the pristine simplicity of the Indians' dress.

Above the painting is seen a very fine skin of a large Land-camoodie (*Boa constrictor*). It is about fourteen and a half feet in length, and is the largest in the Museum. Specimens of this species, however, are said to reach a length of twenty-five feet, while its close relative, the Water-camoodie (*Boa murina*) the largest of snakes,

has been measured from thirty-five to forty feet. Only comparatively small specimens of this latter species, unfortunately, are to be seen in the Museum. The skin of the Land-camoodie exhibited, from its mode of preparation, was unsuited for mounting as a stuffed specimen. The median row of well-defined, light-coloured, elongated areas, alternating with dark, purplish, saddle-like markings, joined laterally to each other and enclosing the light-coloured spots, are characteristic of this species, and easily separate it from the dark-brown Water-camoodie with its double row of circular black patches along the back. The Boas like the allied Pythons of India, are destitute of poison-fangs and poison-glands, and kill their prey simply by constriction, by which means they diminish the size of the object and render it more easily swallowed.

On each side hang charts illustrating the chief types of the higher classes, orders and families of the Animal Kingdom, together with diagrams of the chief geological formations and their characteristic fossils.

Entering the Museum proper, the visitor sees the collection arranged along three distinct lines—one central and two lateral, while miscellaneous specimens hang from the sides of the building. In the central row fronting the entrance, stands a collection of photographs, chiefly of native Indians in their normal costume, and of coolies, taken by SIZA, and by him exhibited in the British Guiana Court of the Colonial and Indian Exhibition.

At this point a certain amount of perplexity is felt as to how best to view the heterogeneous collection exhibited. In order to inspect the different objects in somewhat of classified sequence, the visitor would be

frequently obliged to go from one part of the room to another: to obviate this, it would be better to start on the right hand side, and proceed to the end, then to return along the middle row, and then to take the row on the left hand side, to complete the inspection.

Turning then to the right, the visitor at once notices a large and fine, polished, inlaid table, of colonial manufacture, and composed of the chief woods of the colony. On the floor, just within the doorway stands a curious old relic from a grave in Berbice; this consists of a large flat stone on which is represented the scene of the Temptation and Fall in the Garden—the scene being surmounted by a coronet. The representations of ADAM and EVE, of the fruit, and of the serpent which supports itself comically from the trunk of the tree, are on a peculiarly bulky scale, and to a certain extent, through this bulkiness, the figures recall something of the style of RUBENS —if one might venture to make such a comparison. Overhead on a bracket is mounted the head of what must have been a splendid specimen of the Elk or Moose-deer (*Alces machlis*). These animals, which are about the size of a horse, and are the largest ruminating animals which periodically shed their horns, are characteristic of the northern portion of North America, Europe, and Asia. The horns in the Elk are peculiar; being very broad, palmated and heavy—occasionally weighing as much as eighty pounds, and in correspondence with this the neck is very short and thick, giving an ungainly aspect to the deer. A picture of the animal is given on the chart outside.

On each side of, and below the head of the Moose-deer, are seen paintings of the interior of British Guiana

by Mr. SAWKINS, one of the geological surveyors of the colony; and below these a series of photographs, also of the interior. Some of the paintings have been considerably damaged by broken glass during the passage to and from foreign exhibitions to which they have been sent. On good authority the paintings have been stated to be, on the whole, faithful representations of the country, though many of them were painted from pencil drawings made at the time of the survey. Some of the scenes are extremely, even entrancingly, beautiful, and the combinations of mountain, forest and river are delightfully varied.

In the small hand-cases beneath, opposite to the inlaid table, are seen specimens of eggs, chiefly birds' eggs, and specimens of the skulls of birds—interesting objects for the student—and casts of the bones of the remarkable extinct bird, the Dodo. This bird, of which a picture is given on the chart of birds on the landing, was living in Mauritius about two centuries ago, but has since been exterminated. It was an ungainly object with a very thick and heavy body, bulky and ridiculous-looking head, short and stout legs, and small and useless remnants of wings—a bird, in fact, possessing no power of coping with, or escaping from its enemies. It is usually referred to the group of the Pigeons, its nearest of kin being apparently the Tooth-billed Pigeon or Little Dodo, a native of some of the Pacific Islands.

In the corner, mounted on a stand, are shewn some large and admirable wood carvings executed by Mr. JOHN INGLIS of Berbice. The carvings are made of Euroballi wood from the Berbice River, and two of them represent a crucifix and the design on a

florin, respectively. Close to these is seen an insect-rearing case, of which there are two others in the Museum; and in them are usually to be found different stages of the development of moths and butterflies, and occasionally living insects of various sorts. In front this case is a stand of Kaffir Assegais, weapons of war, dangerous enough in the hands of those who can properly use them, either for stabbing at close quarters or for throwing from a distance; while close by are seen swords of different workmanship, said to have been collected in the East Indies, and many of which are certainly oriental.

On the next table stand two models of Egyptian work: one of Pompey's Pillar at Alexandria, a column built about three centuries after the christian era, in honour of the Emperor DIOCLETIAN, to celebrate the conquest of Alexandria; the other of the Obelisk known as Cleopatra's Needle, but which appears to have had no more to do with CLEOPATRA than Pompey's Pillar with POMPEY. Cleopatra's Needle, which is now erected on the Thames embankment, was built at Heliopolis, the City of the Sun, in the reign of THOTHMES III., more than sixteen hundred years before the christian era, and was re-erected in the reign of RAMESES II. at Alexandria, from which, a few years ago, it was taken to London, after an eventful and stormy passage. Beside these two models are shewn three false measures taken from a Portuguese shop in the city—the capacity of the measure diminished, in one case, by at least one-third. In the hand-cases on the same table are exhibited various articles, such as Kaffir and Chinese pipes, Kaffir and Ashantee ornaments, chiefly anklets, necklaces and arm-

lets of very various pattern, and a Kaffir apron—the complete dress of a woman, and very interesting in its relation to the queyu of the native Indians of Guiana. Beside these there are an old Dutch key of the eighteenth century, Hindu books, and specimens of Mexican, African and Hindu gods ; while samples are also shewn of the size of the grains of powder used for the 81-ton and 21-ton guns respectively, and specimens shewing the ordinary size of the bullet of the Martini-Henry rifle and the size of a corresponding bullet which had been fired at, and had stuck to a target at 700 yards. An interesting collection of coins, some of which date from the eighteenth century, is also exhibited, with a list appended. Overhead hang three certificates awarded to the British Guiana exhibits at exhibitions held in Paris, Philadelphia and London.

On the next table are shewn various old Joes and Government notes, some in Dutch and some in English, many dating from the last century ; while a few are unissued notes which had never been signed. These bank-note-looking objects and the coins, have been the recipients of such detailed scrutiny on the part of some of the uneducated or least educated members of the community, who at the same time have furtively fingered or played with the fastenings to the cases, that it is easy to see they are regarded as being still passable.

On the same table are shewn a few models of boats and ships—one of an old Dutch schooner taking the palm for its unwieldiness, the body of the captain being especially worthy, or rather unworthy, of observation. Beside this is seen a small case of ornamental and useful objects such as brooches, sleeve-links, scarf-pins,

etc., carved out of the seeds of various colonial plants, the carvings having been executed in London for the British Guiana Court of the Colonial and Indian Exhibition. The large and fine china bowl, considered a very old and valuable one, was brought from the island of St. Eustatius, and was obtained by purchase.

In the long, flat case by the table, some specimen of living snake is generally exhibited—usually a land-camoodie; and, for comparison, a stuffed land-camoodie and water-camoodie are shewn on the table, together with the rather roughly-mounted skeleton of a yellow-tail—a yellow-tail of unhappy memory, since it swallowed a very handsome and much-prized little land-camoodie that was being reared. The various bones of the skeleton have not been separated, but have been left attached by their ligaments. After viewing the skeleton of a snake and seeing the immense number of ribs (of which there are sometimes more than three hundred pairs), one is prepared to understand the nature of the movements of the snake, and its speed, since each rib functions as a walking limb, the effect being increased by the extreme mobility of the back-bone owing to the ball and socket arrangement of the joints. An inspection of the articulation of the under jaw also gives the explanation of the immense distention of which the mouth of a snake is capable, and of the power which snakes possess of swallowing very large objects. An extra bone called the *quadrate*, not present in mammals, is found placed between the upper and lower jaw, and the freedom of movement of the lower jaw is increased by the wide gape of the mouth. The snake does not swallow, as swallowing is ordinarily understood. It literally puts

itself by degrees outside its food. Close by is seen a rather large water-camoodie, pictorially mounted, seizing an adourie.

On the next table are shewn cases of metalloplastic paper casts of fishes, chiefly of fishes of Guiana. The casts are excellently done and were prepared by a Mr. MATTES of Surinam. Unfortunately, the different kinds of fish are indiscriminately mixed. Among them are to be seen the haimara *(Erythrinus sp.*, no. 93*)* a species found in most of the rivers of the colony, and yielding a constant supply of food to the Indians: the bayonet-fish or half-beak *(Hemirhamphus sp.*, no. 76*)*, allied to the gar-pike, and having the under jaw much produced while the upper jaw is short and scarcely visible: the ship-holder or sucking-fish *(Echeneis remora*, no. 91*)* one of the mackerels which derives its common name from its power of adhesion to foreign bodies by means of the large sucker or sucking-disk on the upper part of the head; it is a frequent parasite of the shark, and is also commonly found attached to rocks, ships and floating objects generally; by the ancients remarkable tales were told of this small fish, as to its delaying or even preventing the motion of vessels, against the force of several hundred sailors rowing—hence its specific name; according to common report, a species of this fish is used in the East Indies for turtle-catching, for which purpose a rope is attached to the fish, which, being then placed in the sea, attaches itself to the floating turtle, both being then hauled on board: the electric eel *(Gymnotus electricus*, no. 77*)*, this is the largest electric fish, and derives its power from curious organs situated in the region of the tail, and composed of an immense number of closely-packed

minute cells, filled with a gelatinous matter and comparable to the cells of a battery, while a very large number of nerves are distributed to these organs: the saw-fish *(Pristis antiquorum,* no. 66*)* a young specimen of this shark-like fish, which, however, from the position of the gill apertures on the under part of the body, and not on the side as in the true sharks, is classed as a family of the rays; this fish is one of the swiftest and most vigorous of its kind, and is distinguished from all others by the curious elongated beak, studded with sharp spines implanted like teeth; large saws from this fish are shewn suspended from the other side of the Museum, and a large specimen of the fish itself, about twelve feet in length, is suspended opposite the door: the querriman (no. 51) a large mullet highly esteemed as food: the black-striped cat-fish *(Platystoma tigrinum,* no. 54*)* one of the curious Siluroid fishes, a group distinguished by being destitute of scales though sometimes furnished with scattered scutes, and having a mailed head with characteristic barbels or long bristle-like or ribbon-like streamers about the mouth; this cat-fish is a very beautifully marked form, and its flesh is well-flavoured: a stinging-ray (no. 7) one of the great order *(Selachia)* of the Sharks, but distinguished from the true sharks by the flattened body and the situation of the gill apertures on the under side of the body: the needle-fish or ribbon-fish (no. 17) a silvery and extremely elongated form: the four-eyes *(Anableps tetrophthalmus,* no. 10*)*, a curious carp, common in trenches and rivers, having very prominent eyes which by a fold of membrane are divided externally into four areas as though there were four distinct eyes—a character on which its common

as well as its scientific name is based ; this modification has evidently been brought about by the curious method of swimming, part of the head being in water and part in air, the eyes being placed so as to command both elements : the pacamah *(Batrachus sp.*, no. *27)* a common and ugly fish, with a very large and broad, frog-like head, living chiefly in holes in the mud and capable of inflicting a severe bite : the hassar (nos. 31 and 12), a curiously helmeted and very common Siluroid, possessing a considerable power of endurance out of its normal element, and capable of progression on land by means of its strong fins ; these fishes construct nests for their young : the striking-looking logo-logo *(Gymnotus sp.*, no. 46*)* : the gilbacker *(Silurus parkeri*, no. 40*)* a Siluroid of gorgeous colouring and of great economic importance ; the flesh is useful as food and comparable to veal, while the swim-bladder, when dried, forms a most useful glue : the sea-hassar *(Callichthys sp.*, no. 41*)* a quaint-looking and curiously helmeted Siluroid : the flounder (no. 22) a fish which, like the other members of the family *Pleuronectidæ* generally, has undergone a curious modification, by which the body has been extremely flattened from side to side, the fish then swimming with one side, either the right or left (and not the true back), uppermost, both eyes being situated on one side : the snook *(Centropomus undecimalis*, no. 28*)* a tropical perch, highly esteemed as food : and the perai *(Serrasalmo niger*, no. 24*)* a salmon of evil repute, abounding in the upper parts of the rivers, of insatiable rapacity, and hence correspondingly dreaded owing to its dangerous biting power—the jaws being furnished with large, triangular, and extremely sharp, cutting teeth ; these jaws are, or were, necessary adjuncts

to the Indian's quiver. Other specimens of fish will be referred to later..

In the case by the window are shewn an old Dutch wooden lock, old books, a painting of the Museum-Buildings on china, a Burmese gong and striker of unpretending appearance—objects which have once made, and are still capable of making, a great noise in the world; a pair of handsome inlaid sandals, a murderous pair of slings taken from French refugees, specimens of beautifully carved cocoa-nuts, and, lastly, portions of submarine telegraph cables, cut in cross section to shew the central telegraphic wire and the surrounding protective wires and other insulating material—sections being given to shew the size of the cable at the shore ends and in the deep-sea parts.

Next stands a large glass case containing excellent specimens of stuffed foreign beasts, all of the class *Mammalia* or Milk-secreting animals. Unfortunately the types are not well-chosen, the numerous specimens, with but few exceptions, being different forms of the one order *Carnivora*, while many of the most important orders of mammals are not represented by even one type. Here the most remarkable is the curious "Water-mole" of the Australian colonists, the duck-billed platypus *(Ornithorhynchus paradoxus)* of Australia and Tasmania. The jaws are produced and flattened to a broad beak, the toes are completely webbed and the hind limb is furnished with a spur in the male; while the internal organisation recalls many of the features common to Birds and Reptiles. These curious animals lay eggs, and these are deposited in holes tunnelled in the ground, a nest being made of dried leaves and bones. These animals, with one other

form, comprise the lowest group *(Monotremata)* of the mammals. The specimen of the European wolf exhibited is as fine a specimen as one could wish to meet with (but certainly not in large numbers and in a hungry condition). The seals and foxes are equally fine, though the former are not large specimens. The badger with its markings, rare among animals, dark below and light above; the skunk of odoriferous fame, an animal the most capable of all animals of producing at will the most insufferable and disgusting of stenches—special glands for the purpose being situated at the root of the tail—while the animal appears of the most gentle and friendly demeanour; the racoon, the otter, the squirrel, and the stoat or ermine in its winter and summer coat, all these, among others, are well represented. The kangaroo or wallaby and the koala or native "Bear" are two different types of the group *Marsupialia,* a group almost entirely confined, at the present day, to the Australian region, the exception being the opossums or yawarries of the North and South American districts, which forms are not found in the Australian region.

The marsupials are distinguished from other mammals by the special pouch or bag in which the young are carried, supported by special bones, and also—the chief distinction—by their internal organisation. A marked feature in this latter distinction is the absence of the *placenta,* the vascular structure that secures a high development of the young before birth. In the marsupials, therefore, the young are born in a very helpless condition: they are then placed in the pouch or bag, and, being unable to suck, milk is forced into their mouths by special muscles. The oldest remains of mammals, found as fossils in the

Secondary formations, are marsupials; and from the absence of higher mammals, or their remains, from Australia, it is evident that this district was separated at this early period from the mainland, ere the higher forms had been developed and widely distributed. Isolated in Australia, in the struggle for existence, the marsupials have undergone wonderful modifications and have taken on the habits and the external forms of wolves, bears, rabbits, rats, squirrels, bats etc., and they are known to the colonists by these names. Some of the recently extinct marsupials were giants of their kind.

The specimen of the brown bear *(Ursus)* exhibited, that so closely resembles the Australian "koala" or native "Bear," is quite a baby and gives no idea of the size of the adult animal. On the sides of the building, by these specimens, are suspended two badly stuffed skins of the manatee or "water-cow" of the colony—an animal that will be referred to later.

In the next case, is shewn a collection of skulls of different animals. Among them is a series of human skulls—of native Indians, of an European boy, of a negro, of a Chinaman and of a coolie. The throat pouch or vocal drum of the howling monkey, male and female specimens, are also shewn; the male pouch is large and the female pouch, taken from a full grown specimen, is extremely small, so that the males are responsible for the terrific din which causes the stranger to stand aghast. Among the skulls are shewn those of various monkeys, of the ant-eater, the armadillo, the yawarre or opossum, the manatee, the jaguar, various deer, the labba, the waterhaas, and lastly, of the tapir—that curious hoofed animal or ungulate, characterised by the possession of a

short movable proboscis, of four toes on the fore-leg, three being functional, and of three toes on the hind-leg —a type once widely distributed over the northern hemisphere, but at the present day confined to South America and the Malay region.

In the next case are shewn photographs of the pictured or *Timehri* rocks of Guiana (of which a better series is shewn among the photographs already mentioned), and a collection of British Guiana flint-implements from the Warramuri shell-mound and various other districts ; while various objects, such as broken pottery, quartz fragments, broken flint-implements, shells, bones of animals—some human—which were taken from the kitchen-midden or refuse-mound at Cabacaboori, are also exhibited. Overhead is suspended the specimen of a shark which, having been badly prepared, is rapidly shewing the signs of decay.

The next object to be seen is a bronze group by HATFIELD after the original by ARMSTEAD, representing Satan dismayed *(Paradise Lost*, Book I*)*. Satan, the lower part of his body in the form of a serpent, is represented in company with his lieutenant Beelzebub also under the guise of a serpent, but completely so. The concentrated look of hatred, defiance and dismay on Satan's face as he gazes upwards at the majestic expelling Angel, is finely portrayed.

In the next two cases are exhibited skins and mounted specimens of the mammals of the colony. Many of the latter are extremely poor, and it is hoped that sometime soon it will be possible to renew them. The skins are liable to vary in number and kind, owing to the circumstance of mounting: reference will therefore

only be made to the stuffed specimens. Several of these are specimens of the two-toed sloths *(Cholæpus didactylus)* and three-toed sloths *(Bradypus trydactilus).* The sloths are the prey of the harpy eagle, the jaguar, etc., and the curious hairy covering is apparently a modification brought about for protection owing to the resemblance which they thus bear to several parasitic plants with elongated bristly-looking leaves, for which they might be mistaken. In the three-toed-sloth there are more vertebræ, or joints of the back-bone, in the neck, and in the two-toed sloth there are more pairs of ribs, than in any other mammals. These animals are strictly arboreal; while the armadillos, of which several forms are exhibited, are terrestrial and burrowing animals and are modified accordingly. The banded nature of the coat-of-mail in the armadillos allows of the rolling up of the body in the form of a ball for protective purposes. The number of teeth (all molars or back teeth) in the armadillos is considerable, and in the giant armadillo the number (98) is unique.

In the hairy ant-eaters, of which specimens are exhibited of the three different groups, curious modifications are met with. The face is more or less produced to form a snout, the mouth is small, the tongue long and sticky for the purpose of securing their food, and teeth are quite absent. In the great ant-eater, ant-bear or tamanoir *(Myrmecophaga jubata)*, of which a small specimen is shewn, the snout is extremely long, the tail is very bushy and non-prehensile, and the animal is terrestrial; in the middle ant-eaters *(Tamandua sp.)* the snout is shorter, but still elongated, the tail is prehensile, and the animals are arboreal; while in

the small ant-eater *(Cyclothurus didactylus)* the snout is quite short, the tail prehensile for an arboreal mode of life, and the feet two-toed.

These groups, the sloths, armadillos, and hairy ant-eaters, are confined to the Neo-tropical or South American Zoological region. These, together with a few other types restricted to certain limited areas in Asia and Africa, though but of a low grade of mammalian organisation, yet present a decided advance on the marsupial type already described, and are placental animals, the young being nourished before birth by the vascular structure known as the *placenta*. They are members of the great group of the *Edentata*—a group name derived from the nature of the teeth which are never replaced by a second set in these animals, and are destitute of enamel; while incisors or front teeth are never present. This group of animals is evidently a remnant. During late geological periods it was widely distributed; and before the arctic conditions of the last glacial period brought about influences tending to their extinction, gigantic forms roamed in the forests, more especially in this very South American region, where, at the present time, the group is most abundant.

Different species of the yawarries or opossums *(Didelphys, sp.)* are also shewn. These animals belong to the group of marsupials already described, and are monkey-like forms with prehensile tails, and with the hind feet converted into prehensile organs or hands for an arboreal life. The pouch in these forms is much reduced, and becomes too small, in many species, for the support of the young. The opossums are confined to North and South America, not being found

in Australia, and the earliest known marsupial was the Virginian opossum of the United States. From the occurrence of related fossil forms of opossums in North America and in Europe, the path of the distribution of these marsupials in South America is traced out—no land connection between Australia and South America being required for the solution of the problem.

The group of the Hoofed animals or *Ungulata*—the group of the horses, the rhinoceros, the hippopotamus, the oxen, sheep and camels, etc.—is represented by the bush-hog or peccary, *(Dicotyles torquatus)*, with its young, and by a small young specimen of the wood-deer, *(Coassus superciliaris)* of the simple-horned division of this group of the ruminating animals. The flesh of the bush-hog is much esteemed for food, while certain of its teeth are in common use among the Indians for necklaces. Both of these specimens belong to the Even-toed group of the *Ungulata*, while the tapir is the representative of the Odd-toed group of this order, the only living representative of this group native to America, though there were abundant forms in late geological periods. No specimen of the tapir is in the Museum collection.

Of the group of the *Carnivora*, to which reference has already been made as the order comprising the forms allied to the dogs, cats, seals and bears—forms distinguished by their long sharp claws, and by their teeth, of which there are six incisors in each jaw between very large canines or eyeteeth—several forms are shewn, besides the skins of the jaguar on the landing. Thus there is a fine specimen of the ocelot or labba-tiger *(Felis pardalis)* pouncing on an otter, besides

smaller ones. In this species the spots are distinctly lined or chained, and, behind the shoulder, the lines run obliquely down the sides; while a large white spot is present on the back of the ears. The jaguarondi or hacka-tiger is quite a small one, but shows the unspotted whitish black colour of the species; the hacka *(Galictis barbara)* with its large white diamond-shaped patch on the throat; the kinkajou or potto *(Cercoleptes caudivolvulus)* closely resembling the night-monkey in size, appearance and habits, but distinguished at once by its six incisor teeth and by its claws; the grison *(Grisonia vittata)* with its rare colouring, dark below and light above; the otters or waterdogs of which there are three kinds in the colony; the coatis or quassies *(Nasua sp.)* with their very long snouts; and the colonial fox, etc., are all represented.

Of the waterhaas group—the gnawing animals or *Rodentia*, distinguished by the teeth, two incisors above and two below, but no canines—there are exhibited specimens of the aguti and adourie *(Dasyprocta sp.)*, of the spiny or porcupine-rat *(Echimys sp.)* with stiff and flat hairs, of the tree-porcupine *(Cercolabes prehensilis)* of arboreal habits and with prehensile tail, and of the squirrel *(Sciurus æstuans)* etc.

Of the order of the bats *(Cheiroptera)* or hand-winged animals, one or two small forms are shewn in the case, while a specimen of the largest South American bat, the vampire *(Vampyrus spectrum)* is to be seen suspended on the other side of the room. This form which attains a width of more than two feet across the extended wings, was formerly erroneously supposed to be a blood-sucking

bat, but its food consists simply of fruits and insects. The true blood-sucking bat *(Desmodus rufus)* is much smaller, and a specimen is shewn in the British Museum which was taken by DARWIN in the act of sucking the blood of a horse. The bats as a group are distinguished by the extreme length of the front limbs, the fingers of which are very elongated, and are connected by a thin membrane which is continued along the sides of the body to the hind limbs, and forms a wing which in function resembles the wing of a bird, though quite different in structure. The hind limbs are much reduced in size, but serve by its claws to suspend the bats when they are at rest,—in the usual position head downwards.

Of the group of the *Primates* or monkeys, several forms are shown, such as the howler *(Mycetes seniculus)* of roaring repute, the different forms of sakis *(Pithecia sp.)* with non-prehensile bushy tails, the different forms of sapajous *(Cebus sp.)*, together with the sackawinkis and marmosets. The curious long-legged spider-monkeys and the night-monkeys are not, however, represented.

Monkeys, as a group, are well characterised by the hind-feet being modified to form hands, the first toe being opposable to the others; by the first toe or all the toes bearing flat nails instead of claws; and by the dentition, the front teeth or incisors being four in each jaw, as in man. The American monkeys are widely separated from the Old World forms by several characters, of which the chief is that the nostrils are placed far apart, a thick septum separating them so as to give them almost a lateral opening, while in the Old World forms the nostrils are close together, the septum being thin. The tails, moreover, are never prehensile in the Old World forms;

while this is a characteristic feature of the monkeys of the forest-clad South American region.

In the next case are seen various dried and spirit specimens. Above are shewn, chiefly, collections of colonial Reptiles in spirit. Among them are specimens of the rattle-snake *(Crotalus horridus)*, the labarria *(Trigonocephalus atrox)*, the ringed boa *(Epicrates cenchris)*, the yellow-tail *(Spilotes corais)*, together with various forms of coral snakes, whip snakes, water snakes and grass snakes, besides the land and water camoodies already mentioned. Among the lizards are seen species of *Iguana*, a type in which, as in several other lizards, an extra single eye situated in the flesh directly over the middle of the brain, and hence not capable of being used for sight, has been discovered: specimens of the marbled lizard *(Polychrus marmoratus)* a very harmless reptile, but commonly regarded as being poisonous, known as the *gamma* or colonial chameleon: a salempenta, with eggs and young, shewing their very varied coloration: a specimen of the gecko or wood-slave *(Platydactylus rapicauda)*, a very curious and harmless type of lizard, commonly regarded as being poisonous; in the geckos (so called on account of their cry) the toes are much flattened to form adhesive suckers, so that the animal is able to stick tightly to an object in any position; these lizards are rather rare, but are found under walls and houses and in dark situations—hence the eyes are much enlarged; the tail, when broken away, is renewed, but then takes on a very different shape and often becomes somewhat like a turnip; it might be mentioned in this connection that there is but one known poisonous lizard *(Heloderma)* and

this type is confined entirely to Mexico : species of the commonly known "two-headed snake" *(Amphisbæna)* are also to be seen; in this type—a true lizard and not a snake—the limbs are lost, the body becoming serpentiform; the common name has been derived from the fact that each end of the body is about equally thickened, the tail being not easily distinguished from the head. Further reference will be made to the reptiles in connection with the case of stuffed specimens.

Close to these reptiles in spirit, on the right, are shewn specimens of colonial *Amphibia*, the group of the frogs and toads. These animals were once classed with the reptiles, but are now separated, being more closely allied to the fishes, as is shown by the presence of gills during the early part, and sometimes during the whole, of life. The essential characteristic of the animals of this group is the marked metamorphosis that they undergo—a series of changes that is well exemplified by specimens exhibited of the paradoxical frog or "frog-fish" *(Pseudis paradoxus)*. The changes may be thus briefly described. From the egg of the frog or toad, as the case may be, is hatched a curious elongated fish-like form, known as the tadpole. The tadpole does not breathe by means of lungs, as do the adult frogs, but is furnished with external and internal *gills*. The external gills soon fall, and the tadpole then breathing air in the water by means of internal gills is perfectly fish-like. The head at this stage is very large, and is separated from the body by a long slit which, as in fishes, leads to the gill chamber; while the heart is also like a fish's heart, driving blood to the gills to be purified. As the tadpole grows, however, true lungs begin to appear, and the gills

begin to shrivel; the hind limbs grow out and then the front limbs; and the tail is gradually absorbed and eventually vanishes in the adult frog, by which time the gills have quite disappeared, the slits closed up, and the lungs are in full breathing order; and the heart now not only drives blood to be purified, but also drives the purified blood to all parts of the body. The development, however, is not always so complete. In some forms of the group, limbs are never developed; in others, the tail is retained during life; in others, again, external gills are always present with lungs. The frogs and toads, in which the development is complete, are the highest forms of the group and depart most from the fish-like stages in adult life. Their history, however, shows their relationship to the class of fishes. In *Pseudis*, the tadpole or frog-fish grows to an extremely large size, being about nine inches in length (the specimens exhibited are much smaller), and is so perfectly fish-like, as to be easily mistaken for a fish. When this is allowed to develop, a frog eventually appears of about one-fourth the size of the full-grown tadpole—hence the term *paradoxus*.

In the front part of the case, by these *Amphibia*, are shewn a few embryo mammals, such as a fœtal horse, calf, and dolphin, together with a small puppy born without fore legs, and a four-legged chicken and duckling.

Beneath are shewn various forms of colonial fishes in spirit, such as the electric eel, the sucking-fish, the half-beak etc., already mentioned, together with dried specimens of several kinds, many already referred to. Among them are to be seen a very small specimen of the curious hammer-headed shark, with its curious transversely elongated head, like a hammer on the end

of the body; trunk-fishes with their box-like body; globe-fishes or sea-porcupines, blown out and covered with spines; the quaint-looking sea-horse, and the almost equally quaint-looking pipe-fish; the flying-fish (*Exocœtus*, Barbadian specimen) noted for its long flying leaps; siluroids of many kinds and sizes though destitute of their rich colouring and their streamers; the pacu, far-famed for its delicacy of flavour, though less so than its relative the salmon of the northern regions; the cuffum and others, though the specimens are not always satisfactory. A large jew-fish is shewn by the window suspended from the side of the building.

Fishes, as a group, are well characterised by the presence of scales, fins, and gills. Scales, however, are often absent; and gills are sometimes of small importance owing to the swim-bladder becoming a functional lung, as in the curious mud-fishes of Australia, America, and Africa—fishes that thus make an approach to many forms of the class of frogs, being able to exist for long periods out of water, and to take overland journeys of long distances. All fishes produce eggs or are *oviparous*, though, in a few forms, the eggs are retained in the body and there hatched, the fishes then being termed *ovo-viviparous*. Commonly the term *viviparous* is applied in such cases, but it is preferable to retain this term for the mammals where eggs proper are not usually produced.

At the bottom of the case are shewn a few forms of invertebrates, that is, animals destitute of a backbone. The crabs are colonial specimens, but the lobsters are Barbadian. An interesting series is shewn of fresh-water prawns *(Palæmon)* which closely resemble cray-fishes; one, a monster, from Leguan; another smaller

one from a pond in the Botanic Gardens; others from the rivers. These are all types of a very important class of animals *(Crustacea)*, some of which grow to a large size, while others are perfectly microscopic. They are characterised by having the body inclosed in a distinct crust or shell, which, in the larger forms such as the crabs and lobsters, becomes very hard, and is shed periodically; by having the body and the limbs jointed, the limbs around the mouth forming biting organs; and by breathing air, dissolved in water, by means of gills. They are closely related to the insects, but are distinguished chiefly by their aquatic mode of life and mode of respiration, by the number of their limbs, and by the absence of wings. Different forms of these animals are represented on the chart of the class on the landing.

A star-fish with its curious radiate form, and a sea-egg or sea-urchin *(Echinus)* from which the spines (through which it derives another common name "sea-hedgehog") have been broken away, are also exhibited. These are comparatively lowly organised animals, less highly organised than the crustaceans or insects. The alimentary, nervous, reproductive and other systems are of simple structure. They possess an outer covering that is very firm and hard, often covered with spines, but this test is bored along certain areas to allow very minute fleshy tubes to be protruded, and, by means of these tubes, water is taken into the interior to a system of vessels, and locomotion is effected. The star-fishes are capable of undergoing very great mutilation. Thus two, three, or even four of their arms may be cut off and yet the animals survive and reproduce the lost parts. They possess a very capacious stomach, and being able to

evert this through the mouth, they are able to surround and feed upon objects otherwise too large to be swallowed. The larval stages are free-swimming and of very variable shape. Owing to the presence of a hard spiny shell, the group name *Echinodermata* is applied to the class. Many of the forms are found as fossils in very old geological strata, and some of them, such as the common so-called "sea-lilies", are still found living, in enormous abundance, in certain regions of the deep-sea.

In the corner, overhead, are seen some horns and a skull of the common buffalo *(Bubalus)* of the East Indies. These horns are very large and are quite different from the short horns of the *Bison*, a related form commonly known as the buffalo, but quite different from it, and confined to the prairies of North America. To the left of these are shown some large specimens of stuffed rays.

The large case of native Indian objects, is well worthy of special examination. In the front, above, hangs a line of aprons—an apron or "queyu" forms a complete dress for an Indian woman. Behind and below hang hammocks of various sizes and patterns, one of Brazilian origin, made by Indians on the Rio Negro, and ornamented with feathers in a most beautiful manner. In the centre and at the sides are shewn feather dresses for the head and shoulder. The central figure—a wax model from London—represents an Indian child in its hammock; and on each side of this are grouped necklaces chiefly made of the canine teeth of the bush-hog; armlets of different sorts; flutes made of bones; and stringed seeds which, tied to a stick and shaken in the dance, produce an effective noise. Behind is a large Warrau wrestling shield; on each side of this hangs a quiver of

blowpipe arrows tipped with ourali poison, while the long blowpipes are also shewn, together with hunting arrows and bows used for shooting fish etc. Sets of baskets of various kinds occupy the bottom at the centre; on each side follow packs for carrying burdens, cassava basket sieves, cassava graters made of particles of stone fastened to a board by means of a resinous substance; while long cassava squeezers hang above. Leaning in the right corner are various paddles; below is a model of a canoe: in the left corner lean various clubs, some paddle-like; while below is a collection of fire-sticks. Along the front are placed goglets of different kinds, and other pottery; above them stand various hollow dancing-sticks surmounted by rude imitations of animals; and in the centre a rude Eolian harp, made of the leaf-stalk of the Æta palm, the strings being made of the strong fibres raised above the surface. Various other objects are seen such as drums, balls of cotton for hammock-making, a queyu in course of manufacture, a model of an Indian house, etc. Outside are Indian stools, and large paiwarrie pots.

Turning along the central row, the visitor sees, first of all, a large case containing a water-cow or manatee, caught on the East Coast. These animals which are confined to the tropical shores and estuaries of the Atlantic, form, with the dugong of the East Indian seas, a small herbivorous group of mammals, called the *Sirenia*—though the resemblance to a Siren is difficult to imagine. They were once classed with the whales, which they resemble in the absence of hind-limbs and in the presence of a large horizontally placed caudal fin; but their real affinities are with the herbivorous hoofed animals or ungulates. The skin in the manatee is very thick and

yields excellent leather, while the flesh is good for food. An arctic form of the group has become extinct within the last century.

Next follow cases of birds, but these will be referred to later. Above them is suspended a large alligator or cayman from the Essequebo. In the alligator the toes are incompletely webbed; and the large, prominent, canine tooth in the under jaw is received into a hole in the upper jaw, and is *not visible outside* when the mouth is closed; while in the crocodile the toes are completely webbed, and the canine tooth, when the mouth is closed, projects outside in a groove of the upper jaw (seen in the skull hung on the other side of the Museum.)

Next follow cases of sponges and corals and polished shells. The sponges exhibited are of two kinds; one in which, as in the ordinary washing-sponges, the skeleton consists of horny fibres, and the other in which it consists of siliceous or glassy matter. A third or calcareous form is not represented. During life, the framework is covered with a slimy, gelatinous matter continued all through the interlacings of the fibres, and this matter is made up of small units of flesh, or *cells*, provided with vibratile hairs, or *cilia*, which cause currents to traverse the body, and by means of which food is brought to the sponge. The sponges, though for a long time regarded as of a vegetable nature, are by no means the lowest forms of animals. They start life as a single cell or unit, and by repeated division form a bag-like structure made up of two layers—the outer layer for sensation, the inner for digestive purposes. By repeated budding the sponge grows to a large size of very varied shape. A nervous system, developed from the outer layer, has lately been dis-

covered in these organisms. The glassy sponge exhibited is commonly known as Venus' flower basket *(Euplectella)*—a form found in large numbers in various parts of the world, especially in the Philippine Islands, often in deep water.

The corals form a very interesting group, since by their means have been built up whole series of islands in the East and West Indies—a process that is still going on; while very large areas of the earth consist of their fossil remains. The coral animals, erroneously called "insects," are very like the soft-bodied sea-anemones, but instead of being single they form colonies; and as they are able to take up the lime dissolved in sea-water and deposit it in their tissues, they form calcareous skeletons. By continuous growth upon a suitable position, they give rise to coral islands. The coral colonies take on very different shapes, being sometimes like mushrooms, as in the specimens of *Fungia* in the case; at other times they become tree-like, and are either hard and stony, or pliant, when they may be plaited into whips, as in the specimen shown in the case. Sometimes they form broad fans, as in the specimens of Venus' fan exhibited. The red coral, used for making necklaces etc., is the only form of commercial importance. In the living state, all the skeleton is covered with a thin fleshy layer in which are seen the coral animals like flowers on a plant. The coral-builders live in warm water, being found in the tropics within 30° of the equator; they flourish best at depths of about 5—20 fathoms, and being unable to live out of water, are found below tide mark; while on the other hand they do not flourish at depths much exceeding 30 fathoms. They are an extremely ancient type of life, and are found

as fossils in abundance in some of the lowest strata of the earth.

In the next case are shewn some shells in which the outer layer has been worn away so that the ornamental pearly layer beneath is clearly visible. Among them are seen the pearly-nautilus—different from the paper-nautilus which swims over the surface of the ocean in its delicate boat-like shell—the curious sea-ears or ear-shells *(Haliotis)* many of which are most beautiful, while the flesh is useful as food; the armed spider-shells *(Pteroceras)* of fantastic shapes; the beautiful sea-tops or top-shells *(Trochus)*, etc.—but notice will be taken of the shells later.

In the large central case is shewn a very fine collection of small hand specimens of rocks and minerals, collected by Mr. BARRINGTON BROWN on his survey of the colony. Among them are seen large series of specimens of oxide of iron, oxide of manganese, sandstone, conglomerate, white and pink clay, mica-schist, greenstone, gneiss, plumbago, quartz-porphyry, jasper, quartz—three specimens, nos. 190, 191, 192, containing gold—granite, syenite, etc. Several of the specimens are in various stages of disintegration, showing the results of weathering. A specimen of sandstone (no. 73) shews suncracks as seen commonly in the stratified rocks.

A small case of mixed corals is next noticed, among them the spiny coral *(Mussa)*, the branched coral *(Pocillopora)* with minute cups, etc. These, like the forms already noticed, are true corals, that is, are made by little beings similar to sea-anemones; while the fan-shaped blood-coral *(Stylaster)*, the finger-like coral *(Distichopora)*, and the large "sea-ginger" or stag's-

horn coral *(Millepora)* are made by minute beings, lower in organisation, similar to the little fresh-water polype *(Hydra)* found commonly in ponds, but different from it in habit since they live in colonies and secrete a skeleton of lime. These little beings, or, as they are technically called, *zooids*, are curiously modified to perform different functions: some only feed, others again only procure food and defend the colony; while the latter are gathered several together around each of the feeding-zooids. These hydra-like beings and the sea-anemones both take the form of a double-layered, cylindrical bag, one end of which is furnished with an aperture to the cavity within, and is surrounded with a circlet of feelers, or *tentacles*, for offensive and defensive purposes, while the other end fixes itself to rocks, etc. If this bag-like cavity be cut across, the hydra-forms are seen to have only a simple hollow space or stomach in the middle, while the sea-anemone has, besides, a series of folds or vertical divisions forming several chambers. The animals that form *coral* belong to one or other of these two closely-allied groups, the few hydra-like forms being classed as the *Hydrozoa*, and the numerous forms which are like the sea-anemones as the *Anthozoa* or Flower-like animals.

Along the rest of the table is shewn a large collection, almost entirely of foreign shells, the arrangement of which will soon be revised and localities notified. As at present shown, the different kinds of shells are often mixed. In general terms, they consist of three kinds:

(1.) The bivalve shells or shells of two pieces, technically forms of the class *Lamellibranchiata*, so called on account of the form of the gills *(branchiæ)* which are

arranged in plates *(lamellæ)*. To this class belong the oysters, mussels, cockles, scallops, etc., of economic importance. A few bivalves—such as the lamp-shells, among which are to be found some of the most ancient living forms—are known, which belong to another group *(Brachiopoda)*, none of which are in the collection.

(2.) The univalve shells, technically forms of the class *Gasteropoda*, so called from the fact that these animals seem to walk on their stomachs. To this class belong the whelks, periwinkles, limpets, snails and spiral shells generally. Sometimes the shell is much reduced and scarcely visible, as in the slugs; at other times it forms a distinct simple cone, as in the limpets; while again it may consist of eight distinct pieces, as in the ancient mail-shells, *(Chiton)*. A few forms of this class instead of breathing by means of gills, breathe by means of a lung-like chamber, and are terrestrial (slugs and snails).

(3.) The flat-spiral shells, technically forms of the class *Cephalopoda*, so called from the head being covered up by the foot-like or arm-like portion. To this class belong the two forms of nautilus, the octopus, and the other cuttle-fishes. Many of these possess no true shell, but only an internal bone, known as the cuttle-bone. In those that have true shells, as in the pearly-nautilus, the shell is divided by cross partitions into chambers made and occupied successively as the animal grew in size. The animal thus lives only in the outermost chamber, the others being empty.

The animals of all these groups are known by the general name of Molluscs, or soft-bodied animals. They have no backbone or hard internal supporting tissue, and are destitute of the joints or rings found in the worms,

crustaceans and insects. They are highly organised forms, the different systems being well developed. Commonly they are termed "shell-fish"—the term being derived from the presence of the hard calcareous layer secreted by the lining of the outer-fold, or *mantle*, of the body. This shell is all that can be shewn in the dry state. An extremely large number of fossil shells are known, some of immense antiquity; and many of the geological strata are recognised by their shells. In the charts on the landing will be found illustrations of all the classes of molluscs, both recent and fossil forms being given.

Starting from the coral case, on the left facing the door, the visitor sees first the large bivalved or double-valved wing-shells *(Pinna)*. The threads by means of which these animals adhere to various objects, are very long and silky, and have been woven into gloves as curiosities. In the following cases, reference will only be made to the more special shells, a few out of a large number to be seen. In the first case are seen the beautiful one-valved volutes *(Voluta)* among others; in the next follow some very interesting bivalves, such as the long razor-shells *(Solen)*, forms that live buried in the sand, and the various boring shells, such as *Pholas* the stone-borer, and *Teredo* a form that bores into wood, and thus becoming a pest to sailors and pier-masters; in the next, specimens of different snails, and the very curious mail-shells *(Chiton)*, which are composed of eight overlapping bands; then follow, in the next, the flat-spiral shells of the cuttle-fish group, the pearly-nautilus *(Nautilus)* and the delicate *Spirula*, which is properly an *internal* chambered shell—the paper-nautilus *(Argonauta)* the commonly-known

surface nautilus with its delicate, boat-like shell, is not represented. The shell marked *Hyalea* belongs to an oceanic, beautifully luminous, free-swimming form, often classed as a separate group of Molluscs *(Pteropoda)* owing to the wing-like mantle which it possesses. Close to this is a broken specimen of the lovely purple or violet-shells *(Janthina)*, together with a specimen of Venus' comb *(Murex)* bristling with sharp, close, and long spines.

Turning round by the door to the other side, the visitor sees other fine volutes *(Melo)*, together with a fine series of the cone-shells *(Conus)*—of which group certain shells are extremely valuable, one having fetched as much as £50, for Museum purposes in Europe—close to these is shewn the handsome staircase-shell *(Solarium)*, together with the equally handsome wentle-trap *(Scalaria)* with its regular ridges and bars. In the next case are seen the poached-egg shell *(Ovulum)*, and the curious weaver's-shuttle shell *(Birostra)* drawn out at each end into a long canal, and close by are the spider-shells *(Pteroceras)* with curious armlike projections. The next case shews a collection of important bivalves, such as oysters *(Ostrea)*, cockles, *(Cardium)*, scallops *(Pecten)*, etc. Among them is the remarkable hammer-shell *(Malleus)*. In the last case various forms of the beautiful cowries *(Cypræa)* are exhibited, among them the white or money-cowry *(Cypræa moneta)* used in certain parts of Africa as money. Many of the cowries are used in making cameos.

In the small hand-case on the table is shewn a cowry shell on which the Lord's prayer has been cut—a marvel, evidently, to one small boy visitor who assured others that it had been found at the bottom of the sea like that.

With this are shewn some most lovely specimens of the sea-ears or ear-shells *(Haliotis)*, resplendent with beautiful and changing hues. In these one-valved shells, the spiral is much reduced and nearly absent. A valve of an English scallop shell, on which two very distinct types of life are visible, is also exhibited in this case. In one type, belonging to the group of the Molluscs, the animals, which are always very minute, form small colonies which incrust stones, shells and other objects, sometimes even forming branched masses. On the scallop valve, many of these little incrusting patches are to be seen, and they have been outlined in ink to make them more visible. Each patch consists of little egg-shaped or pitcher-shaped cells, or shells, all joined together, and during life each was occupied by the minute animal that formed it. Though so minute, these forms of life are highly organised, being true Molluscs of the class *Polyzoa*—the name given in reference to their living in colonies. Often, on the same object, numerous groups of colonies may be found, each of which may be totally different from the others in structure, as much so as the different shells of other forms from each other.

The other type of life represented on the shell is seen in the form of little brown sprigs or upright growths. These also consist of colonies of little cells—pitchers or tubes; but the animals that form them are of very humble structure, being indeed like the little *Hydra* or fresh-water polype, that was described in connection with the blood-corals. Unlike the *Hydra*, they bud repeatedly to form branched masses like trees, on which the little beings or zooids appear as flowers, so that to the ancient naturalists these forms of life were marine plants, and even nowadays

they still bear the name of *Zoophytes* to denote the plant-like appearance. A very curious fact in their history is that the rooted forms produce buds utterly unlike themselves, which break off and swim about as jelly-fishes; and these jelly-fishes produce eggs which hatch out, not into other jelly-fishes, but into hydra-like forms which become rooted and develop into plant-like colonies similar to the original form and producing similar sets of buds. This series of changes shews an alternation of generations that is most peculiar. These animals belong to the class *Hydrozoa*, already described.

On this same table are seen large univalve helmet-shells *(Cassis)* used in making cameos, and small specimens of the double-valved clams. The giant clams *(Tridacna)* of the East Indies are often more than five hundred pounds in weight, and the flesh is used as food in many of the islands, one being sufficient for many people. An ornamental arrangement of shells is also shewn under a glass-shade—the shells being made up into flower patterns. Small cases on the table contain limpets *(Patella)*, noted for the tenacity with which they adhere to the surfaces on which they are found, oysters of different sorts, different sizes of the lemon or elongated land-snails *(Bulimus)*—a common colonial form—and other varieties of colonial snails, such as the apple-snails *(Ampullaria)*, etc. The eggs of *Bulimus* are also shewn, presenting a curiously bird-like form, being often mistaken for them, though the surface is much rougher.

Along each side of this central row of tables, and slightly raised from the floor, are arranged large polished specimens of the chief woods of the colony. The names, common and scientific, where possible, have been affixed

to the specimens, together with a short description of the woods, as compiled for the catalogue of the exhibits of British Guiana at the Edinburgh International Forestry Exhibition.

After examining these woods, the visitor is to go to the left hand side of the Museum. The objects first seen are flint-implements from Florida, Honduras, Denmark and Prussia. They represent the older and roughly-chipped flints, as well as the later and polished specimens, used by man as tools and weapons in the early ages before metal implements were made. A stone war-bludgeon from New Zealand is also shewn. Next to these are seen various chemical products obtained, by various modes of treatment, from crude coal-tar—a common waste product in former years. They include the several varieties of carbolic acid, the various carbolised surgical preparations, the different kinds of disinfecting powders, the splendid dyes such as picric acid, aurine, chrysophenolene, etc, and the various metallic carbolates, such as those of lead, lime, etc. A specimen of carbolic sugar, or *saccharine*, is, however, not yet included in the collection.

On the next table is shewn a colonial collection of the forms commonly known as Insects; but they include three distinct types, such as :—

(1). The true insects *(Insecta)* distinguished by having the body made up of three distinct parts, the head, thorax and abdomen, by having *three* pairs of legs and one or two pairs of wings on the thorax, by the absence of limbs from the abdomen, and by the presence of air-tubes, or *tracheæ*, for respiration, running through the body.

(2). The spiders and scorpions *(Arachnida)* distin-

guished by having the head and thorax fused into one and the abdomen generally distinct, by having *four* pairs of legs and never wings on the thoracic part, by the absence of limbs from the abdomen, and by the presence either of tracheæ or of lung-like sacs for respiration.

(3). The centipedes *(Myriapoda)* distinguished by the head being distinct from the thorax and abdomen which are alike, by the presence of a large number of legs, but never wings, on the thorax and abdomen, and by the presence of tracheæ for respiration.

Each group is fairly well represented, but as the whole collection is in process of renewal and re-arrangement, the old specimens having been indiscriminately mixed and much damaged through the influence of light, no detailed reference to them is advisable. The true insects occupy nearly all the cases; and all the chief orders are represented. In the first case is shewn an index collection, in which typical specimens of each order are placed to illustrate the classification of insects, and this will serve as a guide to the other cases on the table. Insects are classified primarily according to their metamorphoses, or the series of more or less marked changes which they pass through during development. Thus in the four groups or orders of the Butterflies, the Beetles, the Flies, and the Bees, the metamorphosis is complete. From the egg is hatched out an active, vermiform grub, or *larva*, which eats voraciously and grows in proportion, changing its skin repeatedly; after a time the larva changes into a very different form, the *pupa* or second stage, when it is quiescent unless touched, incapable of changing its place or of feeding, and is often fixed to some object. In certain forms, as in the silk-moths, the larva, while changing

into the pupa, surrounds itself with a case or "cocoon" of minute delicate threads, and from these the silk of commerce is derived. After a period of rest, the pupa changes into the fully developed insect or *imago.* In the three orders of the Cicadas and Bugs, the Grasshoppers, and the Dragon-flies, the metamorphosis is incomplete; in these, the larva has the form of the adult insect, but is destitute of wings. By the outgrowth of the wings (which, in insects, are simply the lateral extensions of the second and third joints of the thorax), the adult form is reached. In the remaining insects, which are wingless, there is no metamorphosis, the larva differing from the adult only in size.

Among the butterflies and moths *(Lepidoptera)*, forms easily recognised by the hairs or scales on the wings, are to be seen the gorgeously coloured blue butterflies *(Morpho)*, with their variously-marked, brown underwing; the pale grey and yellow, long-tailed forms with black markings *(Papilio)*; the beautiful Dido *(Cethosia)* with its pale yellow green areas—quickly destroyed by light—and with its curiously-shaped pupæ, brilliant during life with mirror-like areas; the fairy-like diaphanous forms *(Hœtera)*; the vividly-coloured, black and golden green striped, and tailed moth *(Urania)*; the large dark-grey or ashy-black moths *(Erebus)* variously marked; the different forms of the narrow-winged hawk-moths; and an interesting series of the Attacus silk-moth *(Attacus aurata)*, shewing the eggs, the caterpillar, the cocoons, the corded silk from the cocoon, the chrysalis, and various sizes of the fully developed imago. In many other examples different stages of the insects are also shewn.

Among the beetles *(Coleoptera)*, forms distinguished by

having the first pair of wings modified to form hard wing-cases for the second pair, are many handsome, large, and often fantastically shaped specimens, such as the horned stag-beetle *(Megasoma)* of immense size; the horned rhinoceros-beetle *(Phanæus)*; the cocoa-nut root-boring beetle *(Scarabæus)* with larvæ and pupæ; the long-legged, parti-coloured harlequin beetle *(Acrocinus)*; the large and striking-looking sawyer or carpenter beetle *(Prionus)* with long and powerful serrated mandibles by means of which it cuts off branches of trees; the giant Buprestid with golden purple wings often used for necklaces; the proboscis beetles or weevils *(Curculio)*, of which the larvæ of one form *(Calandra)* are eaten under the name of grou-grou worm and are highly esteemed; the spring-beetles *(Elater)* some of which are luminous and known as "three lights" *(Pyrophorus)*, with two oval luminous spots on the sides of the thorax, popularly regarded as eyes—the true eyes, however, being in front on the head; the various forms of fireflies, cocao-boring beetles, and lady-birds, and others. Of the group of the flies, midges, gnats, and mosquitoes *(Diptera)*, forms distinguished by the possession of one pair of wings, the hinder pair being represented only by knobs, a few forms are shewn; while a larger series represents the bees, wasps (marabuntas), and ants *(Hymenoptera)*, forms distinguished by the possession, usually, of four membranous wings, and of special mouth organs for biting or sucking purposes. In this group alone, among insects, are found forms capable of stinging, owing to the presence of a long pointed organ connected with an acrid gland at the end of the abdomen. Nests of various species of this

order are shewn suspended at the side; one, a pear-shaped nest with an aperture below, and with transverse partitions within, each pierced with a central hole to give communication throughout (as is seen in the section exhibited), is especially worthy of observation.

Of those orders, of which the various members undergo an incomplete metamorphosis, several forms are shewn. Thus of the group of the grasshoppers *(Orthoptera)*, forms distinguished by the plaited wings, the hinder pair of which are very large, and by the biting mouth parts, specimens are shewn of the running type, as the cockroaches; of the walking type, as the *Mantis* or praying-insects and the walking-stick insects; and of the jumping type, as the crickets, locusts and grasshoppers. The popularly termed "locusts" are destructive grasshoppers, and specimens are shewn of forms from Central Europe, Cyprus, and the United States, with colonial forms. The true locusts bear a long curved organ at the end of the body. They are represented by several forms, among which are the true leaf-insects, the front wings of which are strikingly leaf-like in form, colour and venation. Of the group of the dragon-flies, the may-flies, and termites or white-ants *(Neuroptera)* forms distinguished by the presence of four equal, very delicate, membranous, lace-like wings, a few representative forms are shewn. Of the group of the cicadas and plant-lice, *(Hemiptera)* forms with sucking mouths and with the front pair of wings usually not perfectly membranous, several specimens are shewn. Among them the species of "six o'clock bees" *(Cicada)* noted for their screech-like noise caused by two vibrating plates on the abdomen of the males; the true lantern-flies *(Fulgora)* with their immense globe-like

prolongation of the head which is said to be brilliantly luminous at night, and the various forms of plant-bugs, several of which possess long, oar-like, hindermost legs, as in the passion-flower bug *(Diactor)*. Of the wingless, lower insects *(Aptera)* such as the lice etc., but one or two forms are shewn.

Of the class *Arachnida*, already mentioned, forms are shewn of several spiders, as for instance of the bird-eating spider *(Mygale)*—the colonial tarantula—of which the biting poison-fangs are very large : and of the spined spider with bifid abdomen *(Acrosoma.)* A fine specimen of the scorpion-spider *(Phrynus)* with the long setaceous modified first pair of legs is also shewn, together with specimens of scorpions of various sizes, one shewing the young, *in situ*, on the back, as carried during early life. The scorpion stings with the last segment of the body, injecting poison therewith, and simply grasps with the powerful nippers ; while the spider bites with its poison-fangs which are situated in front of the mouth. Of parasitic forms of this class, such as the mites and ticks, it is curious that one very minute form *(Demodex)* is found only on mankind, and inhabits the sebaceous follicles of the nose in every individual.

Of the class *Myriapoda*, already mentioned, some large specimens of centipedes are exhibited, one being turned upwards to shew the position of the biting organs which are placed behind the mouth, continuous with a swollen poison-gland at the basal part Other forms of this class are placed by these, forms known as millipedes owing to their very numerous legs, of which two pairs are placed on each segment or ring of the body.

The classes of the crustaceans, insects, spiders and

centipedes, form the great group of the joint-footed invertebrates *(Arthropoda)*. They agree in having the body ringed or segmented, and in having the limbs made up of many joints. They thus differ from the great group of the worms *(Vermes)* in which the body is ringed, but the appendages are unjointed.

On the next table are shewn specimens of various kinds, chiefly of colonial and foreign minerals and ores, and of foreign fossils. Among them will be found two nuggets of gold from the Puruni river, with other specimens of gold-quartz from other parts of the colony; a fine and very rich piece of auriferous quartz, from the Saramacca river, Surinam; a specimen of silver ore from Bolivia; specimens of quartz, mica, asbestos and blacklead; ores of iron, copper, lead and tin; a portion of the root of a fossil coal-plant; a piece of Chinese soapstone, beautifully carved; portions of granite and slate shewing dendritic and other markings (*not* fossil plants) produced by crystallisation; various fossil shells, such as ammonites—belonging to the cuttle-fish class—sections of fossil wood, and a fine piece of letter-wood.

On the side hangs the skull of a small whale, taken from a specimen that was stranded on the Essequebo coast some years ago. By many people, the whales, dolphins and porpoises are looked upon as fishes, like sharks—simply from the fact that these forms are aquatic and have a fish-like body. They are, however, quite distinct from fishes. They breathe air by lungs, not gills; they suckle their young and are therefore true mammals which have lost their hind limbs from an aquatic mode of life, while the tail has taken the form of a broad horizontal fin—unlike the vertical caudal fin of fishes. They are

placental mammals of carnivorous habit, and they form the order *Cetacea.* In some forms, teeth are well-developed; in others, the palate is provided with closely-placed vertical plates which furnish the whale-bone of commerce. Whales are fished for not only for the purposes of making whale-oil, but also of obtaining the substances spermaceti and ambergris. They are the largest of all animals, ranging to as much as from eighty to one hundred feet in length; but the size of the œsophagus in these great brutes is abnormally small, and their food consists of small fishes and crustaceans, soft molluscs, marine worms, and other small surface organisms, which alone they are able to swallow.

In the next case, the first upright case, are exhibited specimens of foreign birds for comparison with the colonial birds. Unfortunately, as in the foreign mammals, the types are badly chosen, a very large proportion being of very closely allied families, and many even of the same genera and species The specimens, however, are very fine ones.

Among them are to be found very interesting specimens, especially interesting in the contrast which they present with the birds of the colony. In the under part of the case is seen a large series of specimens of the hornbills *(Buceros)*, African and Asiatic birds in which the bills are extremely enlarged, one bill, as it were, piled upon another, rivalling and doubling the size of the largest bills of the colonial toucans. As in the toucans, this large bill is filled up with an open cellular tissue, which renders the large mass extremely light. By these is seen a specimen of the crested or crowned crane *(Balearica pavonina)* remarkable for its crown of

golden feathers on the head and its bare crimson patch behind the eyes. The colour of this patch fades after death. This bird is a native of North-western Africa. Its voice is extremely loud, and it uses it with effect during its various antics. A fine specimen of the snowy owl is also to be seen; and, above this, there are specimens of crows, those wonderfully clever and cunning perching birds, which, by many very high authorities, are considered to be, as well from their very large brain as from their mental characteristics, the highest type of the birds. Close by is seen a specimen of the curious group of the penguins, birds in which the wings are nearly absent, and the hind limbs placed nearly at the end of the body, causing the erect posture of the bird. Below this is that curious Australian kingfisher, the laughing jackass *(Dacelo gigas)*, so called from its characteristic cry.

In the upper part of the case, by the window, the large crowned pigeon *(Goura coronata)* of New Guinea attracts attention. Following this are seen many lovely specimens, and chief among them the Australian parrakeets, the African cuckoo, the blue jay of America, the Siberian jay, the Indian rollers *(Coracias etc)*, and the magnificent species of Australian and Indian kingfishers—many of which are simply types of beauty. One type of kingfisher still retains the name *Halcyon* by which it was known to the Ancients, who described the seven days before and after the winter solstice as the *Halcyon* days, during which the bird would build its nest on a perfectly calm sea. As it happens, the kingfisher does not carry out its part of the story, since it builds its simple nest, not floating on the sea, but in a tunnelled channel

in the banks of streams etc. Near the kingfishers, are seen equally lovely specimens of the Australian and Indian breves or ant-thrushes *(Pitta)*, and the remarkable " Birds of Paradise" with their wonderfully graceful plumes—as though the birds were anxious to hide their close alliance to the dowdy crows. An egg of the American ostrich, or *Rhea*, is shewn—but unfortunately not the bird itself. The *Rhea* is the American representative of the ostrich order *(Struthiones)*, that very ancient group of birds in which the breast-bone is broad and destitute of a keel, in correspondence with the very rudimentary size of the wings, which are useless for flight —in birds of great flight as in the hawks, the opposite condition is met with, and the breast-bone is marked with a very strong median ridge or keel to which the muscles of the wing are attached. Above these specimens is shewn the sulphur-crested cockatoo. The cockatoos form a group of the parrot order, and are found only in Australia and the neighbouring districts.

Turning round to the other side of the case, the visitor sees, close by the cockatoos, specimens of the pigeons, among them the widely-known letter-carrier pigeon ; while, in the upper and lower parts of the case, are arranged different forms of the snipe, woodcock, and heron order, and also of the fowls or poultry order. In the upper part are specimens of snipe, rails, quails, partridges and grouse, the most interesting being a very fine male specimen of the capercailzie *(Tetrao urogallus)* in courting plumage. This bird, which is the largest of the grouse and was formerly common in Scotland, has recently been exterminated ; but it has lately been re-introduced from the more northern countries in which

it is still plentiful. In the under part of the case are placed some large and very fine specimens of the pheasants. Among them are the common English pheasant, the golden pheasant with its beautiful ruff and crest and its handsome elongated tail feathers, the beautiful horned tragopan, with its curious pendent flap of skin which hangs from the lower jaw and can be inflated at will, and the monal pheasant, in which the various colours of the rainbow vie to rival each other in richness.

In the following cases are to be seen specimens of grains and meal of different sorts, starches, beans, and various seeds of commercial importance, together with spices, dyes, wax, and other economic products.

Overhead hangs a very fine specimen of the vampire of South America *(Vampyrus spectrum)* already referred to, erroneously thought to be the blood-sucking bat. Under this is seen the skull of a crocodile. In the upper jaw are plainly seen the two grooves, one on each side, close to the front, into which the two external canine teeth fit when the mouth is closed.

An old Dutch cannon, of a very ancient breech-loading make, next attracts attention. This cannon, from the initials which are found upon it, has been pronounced to be at least two hundred years old, and to belong to the time of WILLOUGHBY. The cannon was found buried, while the Boerasirie canal was being made.

In the next case, is arranged a miscellaneous set of specimens—among them, on one side, are collections of fibres and fibrous products, specimens of various rubbers, gutta-percha, balata, hiawa resin, gum animi, isinglass and other fish glue ; vanilla, crab-oil soap, a few medicinal barks and seeds, a sample of beeberine from the

greenheart bark, a Fiji sugar mat-bag, ears of maize from Canada, and samples of ropes made from colonial fibres. On the other side are seen specimens of fibres together with a large collection of models, in wax and paper, of fruit, vegetables and flowers of the colony.

The next two cases, together with the flat cases opposite, in the middle, contain a very typical collection of the birds of the colony. The grouping and naming of these birds will be considerably interfered with in the general re-arrangement of the Museum, since, as at present exhibited, their alliances are not always well shewn. First to be noticed, in the under part of the first case, are the hawks, eagles, vultures and owls, known as the birds of prey, or raptorial birds, forming the order *Accipitres*, easily recognised by the strong, hooked and pointed beak, and the strong legs furnished with large and long, pointed claws. These birds are markedly carnivorous, feeding chiefly on mammals, birds, reptiles, frogs and fish. The owls are nocturnal birds, and the others diurnal. Among them are shewn numerous interesting forms such as the striking-looking swallow-tailed hawk or falcon *(Elanoides furcatus)*, old and young specimens of the crested or harpy eagle *(Thrasaetus harpyia)*, the king vulture, or king of the carrion crows *(Sarcorhamphus papa)*,together with the common barn or screech-owl, *(Strix flammea)*, etc. The swallow-tailed hawk, taking its name from the forked or scissors-like tail, is widely distributed over North and South America reaching even to Europe. The harpy eagle, of which a splendid specimen well worthy of close observation is shewn, is the largest of the eagles, and exceeds the golden eagle of Europe both in its total strength, and in

its thickness of bill, limbs, bones and body. Its wings, however, are weaker, in correspondence with its habits, for it lives only in the dense forests in the interior where it preys upon sloths, monkeys, deer, etc., upon which it suddenly pounces. When the bird is excited, and its crest of feathers is erected, it assumes a most ferocious aspect, that fully justifies the scientific name *Thrasaetus* or courageous eagle. The king vulture is one of the most gorgeously decorated birds, as regards the coloration of the head and neck, in the adult state of more than four years of age. At this time, the front and back of the long bare neck are of a vivid lemon-yellow colour, the sides of the neck and the top of the head of an intense vermilion, while the different parts of the head present striking combinations of blue, black, vermilion and orange. These colours, however, fade after death. The young specimens are comparatively dowdy, and present considerable differences in the plumage. The king vulture suffers no meaner vultures to feed with it, and these latter, profiting by experience, do not attempt it—this is the only kingly prerogative enjoyed by the bird. The vulturine birds are carrion-eaters, and are readily recognised by the head and neck being either quite bare or covered only by down; while the hawks and eagles have the head and neck feathered. The birds commonly seen about the town, and called "carrion-crows" have no affinity whatever with the true crows; they are strictly vultures *(Cathartes aura* and *atrata)*. The barn or screech-owl is perhaps the most widely distributed of all birds, being found in nearly all parts of the world. By ignorant and superstitious people it is regarded as a bird of ill omen, and even as a presager of death; but,

in reality, it is a most useful bird, delighting in destroying vermin. The funnel-like arrangement of feathers, in the centre of which the eyes are placed, and the small hooked beak are marked characters of the owls. The various antics and performances of the living barn owl, when confined, are most ridiculous and amusing.

Of the order of the *Psittaci*, including the parrots and macaws, and the colonial parrakeets and love-birds, several forms are shewn in the upper part of the case. The macaws *(Ara)* are very large and long-tailed birds, and they possess a large bare patch around the eyes: the parrakeets are long-tailed, but are more feathered around the eyes: the parrots are large birds with short and broad tails; while the love-birds *(Psittacula)* are only very small parrots. Several specimens of macaws are shewn, brilliant with blue, red, and yellow feathers These feathers are utilised by the Indians in their various feather ornaments. The parrots are generally green, but this colour is often varied by streaks and patches of blue, red and yellow, seen to great advantage in the hia-hia or sun-parrot exhibited. This form *(Deroptyus accipitrinus)*, which is also known as the hawk-parrot—so called on account of its hawk-like beak—possesses a brilliant erectile crest, or circlet, of red and blue barred feathers, and when this is raised like a Queen ELIZABETH'S ruff, the bird shines forth like a blaze of beauty. The order of *Psittaci* is well characterised by the large and thick, curved bills, strongly curved and notched at the tip, and by the form of the feet, of which two toes are directed forwards and two backwards, thus making a very perfect climbing organ—hence the old name *(Scansores)* of the order.

As will already have been seen in the description of the two preceding orders of birds, the bills and feet furnish most useful characters for the purposes of classification; and this will be still further evidenced in the following orders. Until within recent years, these were the main characters which were taken into account in arranging birds into primary groups, but the increase of knowledge as to the internal structure of these animals, has in recent years necessitated considerable alterations in the old systems, though the alliances of many small groups are still but imperfectly understood. The old order *Scansores*, or climbing birds, included not only the parrots, but also the woodpeckers, the cuckoos, the trogons, the toucans and the puff-birds, in all of which two toes are turned forwards and two backwards; but it is now known that, in spite of this formation of the foot, these birds have no close affinity to the parrots, but are much more closely allied to other forms such as the kingfishers, the swifts, the humming-birds, the goat-suckers etc., which were classed formerly with the thrushes, the shrikes, the finches, the cotingas and the creepers etc., as the order *Insessores* or perching birds. The old orders, *Scansores*, and *Insessores*, have therefore been split up into three. The name *Psittaci* is given to the parrots and their allies, the name *Picariæ* to the woodpeckers and their allies, and the name *Passeres* to the thrushes and their allies.

In connection with the formation of the feet of birds, it might be worth while to notice that only the toes are ever really applied to the ground. The bones which correspond to the sole of the foot and the ankle-bones in man, become partially fused in all birds to form the long

bone which is raised from the toes above ground, a bone which is usually not covered with feathers and is known commonly as the "leg" of the bird, though really it is part of the foot, the leg bones being usually quite hidden by feathers. There are never more than four toes in any wild bird, the outermost or little toe being always absent. The toe corresponding to the great-toe, is almost invariably turned backwards, while the other three toes are turned forwards. The great toe consists of two joints, the second toe of three, the third toe of four and the fourth or outer toe of five joints. By counting the joints of the toes it is easy to tell which toes are turned forwards and which backwards; thus in the parrots the first and fourth toes are turned backwards, while in the trogons the first and second are thus directed.

Of the large order *Picariæ*, very many forms are shewn. Of the family of the humming-birds *(Trochilidæ)*, there are some very beautiful specimens—one, a magnificent king humming-bird *(Topaza pella)* in the upper part of the case, by the window, opposite the fruit models, being particularly worthy of being inspected. Other examples of these birds are shewn mounted in a small case in the middle of the room, while a very large number of species of many shapes and sizes, chiefly of colonial forms collected by the celebrated traveller and bird collector, Mr. HENRY WHITELY, is shewn in the flat case (4). The humming-birds form a well-marked family. The bill is thin, generally much produced and often curved. The tongue is rounded and bifid at the extremity, and extremely extensile, as in the woodpecker, and, as in that type, is worked by

double muscles which are continued behind and above the skull where they are inserted. The feet are very small, reduced and weak, and are only adapted for supporting the bird when it perches. The tail consists of only ten feathers, some of which may be extremely elongated. The wings contain only ten primary feathers, and the muscles working the wings are extremely large, and, in correspondence with this, the keel of the sternum or breast-bone is extremely strong, and high. Their eggs are two in number and very small, and the nest is beautifully constructed. The humming-birds are found only in the North and South American regions, not having extended to Europe, Asia or Africa. In the East Indies, they are represented by the sun-birds, which in external appearance closely resemble them, but which, however, are quite different in internal structure. They are, in spite of their elongated beaks, closely allied to the swifts in structure, and, in the young state, when the beak is not yet grown, the resemblance is strikingly evident, even in the form of the beak.

Of the family of the swifts *(Cypseli)*, a specimen of the large swift *(Hemiprocne)* is shewn in the flat-case (3) in the middle. In this family the bill is short, and very wide in the gape; the wings are extremely powerful; the legs very short and weak, and all the four toes are directed forwards. These birds avoid the ground, and perch on the lofty branches of trees. They are widely distributed throughout the world.

Of the widely spread family of the cuckoos *(Cuculidæ)* a specimen is shewn, in the flat-case (3) in the middle, of the American cuckoo *(Piaya)*, a bird of a ruddy-brown colour above, ashy-grey below, with white bars on the

long, dark tail. In the cuckoos the bill is strong, rather elongated and curved; and two toes are directed forwards and two backwards. These birds have long been notorious for the little attention that many of them give to their eggs and young. They do not build nests, nor do they hatch out their eggs by sitting on them, but, by depositing their eggs in the nests of other birds, save themselves all further trouble in the matter. To this family belong the birds known in the colony by the name of old witch or jumby-birds, *(Crotophaga)*. One of these birds is shewn in the case, close to the specimens of mounted humming-birds. The beak is boat-shaped with a strong keel above. The toes are turned two forwards and two backwards. Their eggs are of a whitish blue colour, and they are deposited by several birds in one nest.

Of the family of the motmots, *(Momotidæ)* a group confined entirely to the tropical American region, mounted specimens are shewn, behind the mounted humming-birds by the window, of the "houtou" *(Momotus)*. This beautiful bird, which presents very varied hues of blue and green, possesses on the head an erectile crest of black feathers surrounded by two shades of blue. The two middle feathers of the tail are extremely elongated, and the bird usually strips off a portion of the barbs from these feathers near the extremity, so as to leave only a small tuft at the end of each. The motmots have rather elongated, slightly curved bills, strongly notched or toothed along the edges; three toes are turned forwards and one backwards, and their outer toe is partially joined to the middle toe, though not to so great an extent as in the kingfishers. They somewhat resemble the beautiful rollers *(Coracias.* etc.,*)* of the East Indies.

Close to these motmots, along the top, are several specimens of different species of the bill-birds or toucans. This family *(Rhamphastidæ)* is wholly confined to tropical America, and is well characterised by the peculiarly enlarged bills, the only approach to the same condition being found in the Old World hornbills already described. The bills are extremely light owing to the open cellular tissue of which they are chiefly composed. The tongue is always very long and feathery-looking; and the toes are directed two forwards and two backwards. The plumage is always rich, and the coloration of the bill, chiefly of red and yellow, but always with patches of white, black or blue, renders it a most beautiful object. Unfortunately, the delicacy of the colours of the bill is lost after death, even after the most careful manipulation, and many of the tints can only be shewn by the addition of paint on the inside. The food of these birds consists chiefly of fruits and insects. They are very plentiful in the forests.

Of the small tropical American family known as the puff-birds or barbets *(Bucconidæ)* a few specimens are shewn, at the inner end of the case, by the parrots. The bill is usually very strong and thick and suddenly curved at the tip *(Bucco)*, but sometimes it is rather thin and curved throughout *(Chelidoptera)*. The nostrils are surrounded with bunches of bristles, the head is extremely large, the neck short, and the plumage dense; while two toes are directed forwards and two backwards. A very curious feature in the Buccos is their want of apprehension of danger. Shot after shot may often be fired at or close to these birds, and they will either not move at all or will but slightly shift their position. *Chelidoptera* some-

what closely resembles a swallow, the wings being long and the bill rather small : it has the habit of selecting high and bare branches for its perches, as do the swifts.

Of the beautiful family of the jacamars *(Galbulidæ)* also confined to tropical America, several forms *(Galbula)* are shewn, close to the puff-birds. In these birds the bill is elongated, straight, compressed and pointed and with a distinct, sharp, central ridge above ; the toes are arranged two forwards and one or two backwards ; and the plumage is of a remarkably brilliant metallic golden-green, occasionally with white, black and blue, chiefly on the under part of the body. These birds closely resemble kingfishers in general appearance ; unlike the kingfishers, they do not feed on fish, but almost entirely on insects. They abound along the sheltered creeks and streams of the forest.

Of the widely distributed family of the woodpeckers *(Picidæ)*, several species are shewn on the other side of the case below the macaws. In these birds, the bill is elongated, stout at base and strong, straight, compressed, and rounded or truncated at the tip ; the tongue is very long and is moved by special muscles attached to the top of the skull as in the humming-birds ; the heads are stout in comparison with the thin neck ; the toes are turned two forwards and two backwards and are furnished with strong claws ; and the feathers of the tail are stiff and pointed, so as to aid the birds in climbing. The noise made by these birds while sounding a tree to detect the presence or absence of insects in the wood, is heard to a great distance, and is a characteristic sound in the forest.

Of the widely spread family of the kingfishers *(Alcedi-*

nidæ), several species are shewn in the under part of the case, below and on the right of the harpy-eagle, of the only genus *(Ceryle)* which is found on, but not confined to the American continent. In these birds, the bills are long, stout and broad at base, straight and sharp, and keeled; and the toes are arranged three in front and one behind, the front toes being more or less united to each other, markedly the outer and the middle toes which are united nearly to the tip. These birds are often extremely handsome, the tints of blue, green, brown, white and black being chiefly present. In beauty, however, they are far behind their Old World allies. They live chiefly on fish and water animals; and they present one of the most characteristic sights in the river scenery of the forest, generally perching on branches or sticks overhanging the water.

Of the family of the trogons *(Trogonidæ)*, a family also found in tropical Asia and Africa, specimens are shewn of the genus *Trogon* placed next to the kingfishers; while others are to be seen in the flat-case (3). In these birds, the bill is short, broad at the base, rather stout, and notched; the nostril is surrounded with bristles, and the gape of the mouth is bordered in the same way; the legs are feathered to the toes; and the toes are turned two forwards and two backwards. These birds, more especially the males, are some of the most lovely of their class. On the upper surface of the body are beautiful metallic golden green, blue and brown tints, while on the under side are vivid masses and patches of either intense carmine or orange against the darker tints—well shewn in specimens in the central flat-case. The feathers are very lightly

fixed in many of these forms, and their proper preservation requires considerable care. Along many of the sheltered creeks and streams and in the forest generally, these birds abound. They feed chiefly on insects.

Of the wide-spread family of the goatsuckers or "who-are-you" birds *(Caprimulgidæ)*, specimens are shewn, next to the trogons. In these birds, the bills are very thin and weak ; the gape is extremely wide and is bristled at the base ; the plumage is of a variegated brown, rich, soft and glossy, and abundant, the body of the bird being quite small in comparison with its feathered condition ; three toes are directed forwards, slightly joined by membrane to each other, and one toe is directed backwards. The birds delight in the evening light, and their flight is rapid and silent. Their food consists of insects which they easily catch in their capacious mouths. By ignorant people, these birds, like the owls which they somewhat resemble, are looked upon as birds of evil omen. The name goat-sucker arose in error, from the supposition that the birds, which frequent the haunts of animals for the insect-pests about them, were in reality helping themselves to the milk of the animals. Their cry is of a very plaintive kind, and strongly calls to mind the sad notes of the human voice.

Of the very large order of the *Passeres* or perching birds, many families are represented. The distribution of the groups of this order presents some very striking features ; thus while the Old World families of the thrushes, the wrens, the swallows, the finches and the crows, are fairly well represented in tropical America, the Old World families of the warblers, the creepers, the shrikes, the flycatchers, the starlings, and the larks, are scarcely or not at all repre-

sented, their places being taken by such families as the sugar-birds, the American creepers, the tyrant-shrikes, the bush-shrikes or ant-thrushes, the manakins, the cotingas or chatterers, the hang-nests or cassiques, and the tanagers, all of which are confined to America, and chiefly to the tropical regions. All these birds are characterised by having rather thin but strong feet, adapted for perching, three toes directed forwards and one toe backwards, the toes being usually long and thin, and with long and sharp, narrow claws. The characters on which the families and other groups are founded, are based on the shapes and sizes of the bills, the position and shape of the nostrils, the length size and freedom of the toes, the relative lengths of the quill feathers of the wings, etc., together with various internal characters.

Of the family of the thrushes, several specimens are shewn in the flat-case (1), not only of true thrushes *(Turdus)* of the colony, but also of the mocking-thrush *(Mimus)* to which group belongs the wonderful mocking-bird of North America. In these birds the bills are rather long, compressed, thin, and strong, and slightly vaulted and hooked at the tip.

Of the family of the wrens, several dull-coloured specimens are shewn in the flat-case next to the thrushes. They are always small birds, and they have thin, long and nearly straight bills. They are common about houses in town, and their twittering is very musical, rising at times almost into song. The formidable name *Troglodytes*, which the tiny common wren bears, has been given to it to describe its selection of some secluded corner or hollow in which to make its nest, the better to hide it.

Of the specially modified family of the swallows, specimens are shewn, close to the wrens in the flat-case (1), of the martins *(Cotyle)*. In these birds, the bills are very short and thin, extremely broad at the base, and coming suddenly to a point at the tip. The tail is forked and the wings are long, sharp and narrow. In general appearance they recall the swifts of the last order.

Of the extremely large family of the finches, a few specimens *(Oryzoborus* and *Spermophila)* are shewn in the flat-case (1) at the bottom on the left hand side. These are commonly known by the vague term of grass-birds. The special mark of this family is the very short, thick, conical bill, very broad and angular at the base, and sloping quickly to a point at the tip.

Of the clever and large-brained family of the crows, a few mounted specimens of the handsome colonial jay *(Cyanocorax)* are shewn in the upright case next to the puff-birds. In this family, the bill is long, strong and thick, keeled above and compressed, curving gradually to the tip.

Of the several families of *Passeres* peculiar to America, and almost confined to the tropical regions, it might be advantageous to give some short account of the most important, since the birds are among the richest in plumage and the most common in occurrence.

The small sugar-birds *(Cœrebidæ)* are represented by specimens of *Dacnis* in the flat-case (1). Many of this family are extremely beautiful. The bill is rather long, slender and arched, often rather broadened at the base, as in the creepers, but the tail is not stiff.

The large family of the tanagers *(Tanagridæ)* comes next in the flat-case (1), and in the front of the upright

case. It is represented by beautiful specimens of *Calliste* of various colours, by the delicate blue-sacki *(Tanagra)*, by the rich ruby-breasted sacki *(Rhamphocœlus)*, and by the rich-red *Pyranga.* Many of this group are extremely common. They are marked by the shape of the bill, which is thick and conical but not very short, triangular at the base, arched above to the tip where it is sharp and hollowed out.

Of the family of the cassiques, troupials, hang-nests or colonial orioles *(Icteridæ)* several specimens are shewn at the top of the flat-case (2), and at the back of the upright case below the toucans. Among them will be found the colonial mocking-bird or oriole *(Cassicus)*, the colonial starlings *(Agelæus)*, the colonial robins (*Leistes*) with brilliant red breasts in the males, the handsome colonial meadow-lark *(Sturnella)* and the troupials *(Icterus)*. The bills in these birds are very curiously formed, being thick at the base, straight or nearly so and pointed, compressed from side to side, the keel running well back on the forehead. Their nests are long and pendent, built on the ends of the branches of trees.

The family of the tyrant-shrikes *(Tyrannidæ)* is represented by several specimens below the cassiques in the flat-case (2) and by some in the upright case below the woodpeckers. Among them are the huge-billed tyrant *(Megarhynchus)*, and the long-tailed tyrants *(Milvulus)*. The common "qu'est-ce-qu'il dits," or "kiskedies," are prominent and typical tyrant-shrikes. In all these forms the bills are rather long, very wide and flattened at the base, compressed at the side to the tip which is hooked ; and the nostrils are hidden by feathers and bristles. These birds have very cruel propensities.

The family of the manakins *(Pipridæ)* follows next in both cases. These are small birds with very short tails, with thick and rather short but not conical bills, with the bills very broad at the base, and the sides gradually compressed to the tip. Some of the species are very handsome, many being black birds with coloured heads—one form, known as the parson-bird, has a white head, the rest of the body being black (in the male).

The family of the chatterers *(Cotingidæ)* contains some of the most beautiful of all birds; and many of these are seen in the front of the upright case. Thus there are the snow-white bell-bird or campanero *(Chasmarhynchus)*, noted for its white colour in the adult male (in the young male and the adult female the colour is a spotted greenish-brown and white), and its curious extensile caruncle, communicating with the cavity of the mouth, by means of which it rings out its weird note; the rich blood-red military chatterer; the brilliant orange-coloured cock of the rock *(Rupicola)* with its peculiar fan-like crest on the head; the strikingly handsome purple-throated and purple-breasted cotingas *(Cotinga)*, and the equally striking, white-winged, pompadour cotinga *(Xipholena)*, the two last species being represented in their natural colours and also in an artificial state produced by heating the purple tints until the purple gives rise to a brilliant and permanent red; the brilliant fire-bird *(Phœnicocercus)* of which only a female specimen is shewn, and other specimens. All these agree in having the bill rather short, broad at the base, and rather flattened, and the gape of the mouth immensely wide, being slit far back under the eyes.

Of the family of the American creepers *(Dendro-*

colaptidæ), specimens are shewn of *Dendrornis* and others, in the flat-case (2), and in the upright case below the woodpeckers. These birds have long and curved, rather thin bills, broad at the base, and tail feathers like those of the woodpecker, the barbs of the feathers being absent from the tip, leaving a sharp shaft to the tail, to assist the bird in climbing.

Of the family of the bush-shrikes or ant-thrushes *(Formicariidæ)* which still remains to be noticed, a few specimens of *Thamnophilus, Pithys,* etc. are shewn in the flat-case (2) at the bottom, and in the upright case next to the tyrant-shrikes. In these birds the bills are long and strong, not markedly broad and not flattened at the base, curved above and compressed at the tip, and strongly hooked; and the nostrils are placed just in front of a bunch of bristles. They resemble the shrikes in their habits, but are forest forms and are more particularly insectivorous.

Of the order *Columbæ* or pigeons, a few mounted specimens are shewn next to the mounted cassiques, and a few skins in the flat-case (3). This group of birds is often classed with the order of the pheasants or poultry, but it is distinguished by many characters, some of which are easily noticeable. Thus, while it has the convex, vaulted upper mandible or jaw of the poultry order, yet the vaulting is confined to the tip; the nostril also pierces a curious fleshy projection; its feet are very differently formed from the fowls, being rather slender in build, with the toes all on the same level, three in front and one behind, adapted for perching; the wings are long and strong, adapted to an arboreal life and for sustained flight; and the young are quite helpless

when hatched, unlike the precocious young of the poultry group. This order is widely distributed over the world, but contains a small number of forms as compared with the preceding orders

The order of the *Gallinæ*, or the pheasants and poultry, is represented by several forms. They agree in having the upper bill vaulted and convex; in having strong legs, often spurred; strong toes furnished with thick blunt claws adapted for scratching (hence the old name *Rasores* applied to the order); and in having the hinder toe generally raised from the ground. To this order belong the quails, the powis or curassow *(Crax)*, the maroodi *(Penelope)*, the maam *(Tinamus)*, and the hannaqua *(Ortalis)*. The specimens of these birds are shewn in the smaller upright case.

The families of the powis or curassow, and of the maam, are confined to tropical America. No members of the family of the pheasants are found in South America. The different forms of this order are admirably suitable for food purposes.

The order *Opisthocomi*, contains only one bird the hoatzin or Canjé pheasant *(Opisthocomus cristatus)*, a type that is apparently confined to British Guiana and Brazil, the distribution in each case being of a very limited kind. Two specimens are shown in the case close to the pigeons. In former ages, this bird was much more widely distributed in South America, shown by its remains being found in the cave deposits.

It was at one time classed with the passerine or perching birds, and at another with the gallinaceous birds or poultry, but its peculiarities have gradually become more known and understood, with this result,

that it is recognised by the highest authorities as being alone the representative of an unique order. The bird is thus, without doubt, the most interesting and peculiar of all the South American birds; and indeed it may be considered, perhaps, the most interesting of all living birds. The formation of several parts of its skeleton is most peculiar; thus the *nasals* (the bones at the hinder part of the nostrils) and the *lachrymals* (bones at the front of the orbit of the eye) form one complete bone instead of being separated, and they are free from the neighbouring bones of the forehead. The *furculum* or merry-thought or wishing-bone, as it is commonly known, a bone that is always otherwise simply jointed to the *sternum* or breast-bone at the one end, and to the two chief wing-bones, or *coracoids*, at the other, is entirely fused with these bones at its extremities, so that the whole forms one complete piece—a condition approached by no other living bird, though the extinct dodo presented an approach in the fusion of the *furculum* with the *sternum*. The bird possesses a very distinct crest, and is thus often known as the crested pheasant. The bill is rather short and thick, strongly curved above and suddenly bent at the tip; the legs are rather long but weak, and the toes are very long with long claws. The plumage is a mixture of white and brown, the white predominating in front, and the brown behind, although the tail is white-tipped. The flesh is characterised by a very disagreeable odour which thus unfits it for food purposes.

The order of the *Grallæ*, or wading birds, is represented by a large number of forms in South America, and many of them belong to genera which are only

found in this region. This order of birds is characterised by the length and nature of the legs. The legs are always long, and the lower part (corresponding to the shin-bones in man) that is usually covered with feathers in other orders, remains bare for a great portion of its length. The toes also are very long, and are but slightly, if at all, webbed. Of peculiar groups which are exhibited in the second upright case, such forms may be mentioned as the beautiful sun-bittern *(Eurypyga)*, the tiger-bitterns *(Tigrisoma)*, the black-crested and curious boat-bill *(Cancroma)*, the spur-winged and horned screamer *(Palamedea)*, and the lovely trumpeter *(Psophia)*; while there are also shown beautiful white egrets and the graceful and handsome ash-necked heron and other species of *Ardea*, the brilliant scarlet *Ibis*, the pelican-stork *(Tantalus)*, the long-toed spur-wing *(Parra)*, together with various forms of plovers, etc. No mounted specimen of the negrocop or jabiru *(Mycteria)* is yet in the collection, though two heads of this bird, shewing the special form of the bill, are suspended from the side behind the case.

Of the order of the *Anseres* or web-footed birds, forms characterised by the toes being completely connected by a membrane, many specimens are shown, such as the curious scissor-bill *(Rhynchops)*, the tern or sea-swallow *(Sterna)*, the long-necked and long-bodied darter *(Plotus)*, the common booby *(Sula)*, the large-billed and pouched pelican *(Pelecanus)* and others. These form the *Natatores*, or swimming birds, of the old systems.

Of the tenth and last order of birds, the *Struthiones* or running birds, such as the ostrich and emeu, to which reference has already been made, no forms occur in Guiana—the only American representative, the *Rhea*,

being found only in the southern parts of the continent.

The collection of birds in the Museum is that one of the different groups of colonial animals, which is best exhibited and most representative. More detailed reference has therefore been made to their modern classification, and especially to that of the more commonly occurring families, than in the case of any other group; while the special features of each group have been pointed out to enable the visitor to become really familiar with the chief forms of the varied assemblage of Guiana birds, as illustrated by specimens exhibited. The popular treatment of such subjects, noticeable in general works on Natural History, is too often attended by a disregard of those main characteristics on which families and main groups are based, so that while a visitor may know that such and such birds are called chatterers, or manakins, or jacamars, he would be quite at a loss to indicate the characters of these groups. In the immense and commonly-occurring groups of the woodpecker order and of the perching birds, more especially, an attempt has been made to help the visitor in this respect.

In the last case that remains for inspection, is a collection of stuffed colonial reptiles (a skull of the gavial or crocodile of the river Ganges is, however, included with the colonial forms). A very large number of the specimens, more especially the snakes, are in sad need of renewal; but it is evidently a very difficult matter to obtain suitable specimens of this group to prepare as mounted or stuffed objects—added to which is the unsatisfactoriness of thus showing such specimens. A few examples of each of the four living orders of reptiles

are, however, exhibited. Thus of the order *Chelonia*, already described, there are several forms of the various tortoises—one the matamata, a species of *Chelys*, having a very peculiar shield or box.

Of the order *Lacertilia*, or lizards, there are specimens of the *Iguana* and the Salempenta. Lizards are distinguished from other reptiles by several characters. Thus they possess small horny scales on the surface of the body as in snakes, never bony plates as in the crocodiles; they are provided with two pairs of limbs, one or both of which may however be absent, although, whatever the condition of the limbs, the internal bones (or scapular arch) to which the anterior limbs (if present) would be attached, are always present, thus differing from the snakes; the tongue is always free as in snakes, never connected throughout to the floor of the mouth as in the crocodiles and alligators; they possess a movable eyelid, like the crocodiles, but unlike the snakes; and the two halves of the lower jaw are fused in the front to form a solid piece as in the crocodiles, unlike the snakes in which the two halves are only connected by ligament. In the case containing the spirit specimens already described, is to be seen a lizard which is somewhat serpentiform, the *Chalcis* lizard, in which the body is elongated, the four limbs extremely small, in fact scarcely visible, the anterior limbs with three minute digits, and the hind-limbs destitute of toes; while the so-called "two headed snake", which is exhibited in the same case, is completely serpentiform, no rudiments of limbs being visible. No dangerous or poisonous lizard has been found in Guiana; though the bite of several of the lizards, from their size, would be very painful and unpleasant. One of the

most interesting of the lizards is the chameleon, a form confined to the Old World; the so-called colonial chameleon is quite a different form, though also able to change its coloration.

Of the order *Crocodilia*, which includes the crocodiles and alligators, several forms of the latter are shewn. The differences between the crocodiles and alligators have already been pointed out. The former are chiefly found in the tropical parts of the Old World, though also occurring in tropical America; the latter are only found in the American continent. The peculiar armature of the skin of the *Crocodilia* is one of the chief marks of the order, but this never forms a box as in the *Chelonia*. Beneath the outer horny epidermis is present a layer of hard bony plates along the elongated lizard-like body; the tongue, moreover, is never free from the floor of the mouth. They are all oviparous.

Of the order *Ophidia* or snakes, a few by no means satisfactory skins are shown. The long worm-like body, the covering of scales, the absence of limbs, the absence of an eye-lid, and the unfused condition of the lower jaw in front, are marks easily noticed about these animals. The ball and socket arrangement of the joints of the back-bone, the large number of ribs which are functional legs in snakes, and the quadrate bone between the upper and lower jaw, have already been alluded to, in the notice of the skeleton of the yellow-tail. From the fact that the two parts of the lower jaw are only connected by ligaments with each other in front, and behind with the quadrate bone, which again is connected by ligaments with a movable bone (Squamosal) of the upper part of the head, it will be readily understood how

easy it is for a snake to distend its jaws so as to take in objects that are considerably larger than the head of the snake itself. The bones are able, so to speak, to separate from each other; while the pliant nature of the ligaments which connect them, allows of an easy adjustment to the shape and size of the object to be taken in.

Snakes may be divided into two main groups (1) the Colubrine (2) the Viperine. The colubrine snakes have the head somewhat elongated and oblong, rounded at the muzzle, and passing gradually into the neck which is generally somewhat thinner, but never markedly so. The head also is covered with large plates, which are known as *shields*, and these are arranged like plates in a pavement, edge to edge—an exception being, however, met with in a few snakes, as in the Boas, where the head is furnished with small scales, as seen in the specimens of the land-camoodie and water-camoodie. The lower jaw is furnished, as in all snakes, with a row of teeth on each side; and the upper jaw bears four sets, of which two form long rows in the palate region of the mouth, while the two outer are set in the *maxilla*, or jaw-bone proper, on each side. The maxilla in the Colubrine snakes is a *fixed* bone, unlike that of the Viperine snakes in which it is movable. According to the nature of the maxillary teeth, the Colubrine snakes are divided into two groups. (1), the harmless Colubrine snakes or those which possess no poison-fangs or poison-glands, and in which the maxilla, on each side, bears a long row of simple teeth, no one tooth being enlarged and grooved. Examples of this group are seen in the Museum, such as the yellow-tail, the camoodies, the whip snakes etc. (2.) The poisonous Colubrine

snakes or those which instead of having rows of teeth in the maxilla, have one large fang in each, sometimes with one or more smaller teeth behind—the large fang, which is not perforated in the centre, but is grooved on one side, being connected at the base with a poison-gland. From the fact that the jaws are fixed, it follows that these poisonous Colubrine snakes, have the fangs permanently erect, as will be seen by opening the mouth of any of the poisonous coral-snakes which belong to this group. The deadly cobras of India belong to this division.

The Viperine snakes differ markedly from the Colubrines. In them the head is short, triangular and flat, bearing very small, overlapping scales on the top; and there is a very sudden constriction at the end of the head to form the neck. The maxilla, instead of being long and fixed, is short, thick and movable; and it carries one long perforated poison-fang which is connected at the base with a poison-gland; the poison-fang is sometimes followed by one or more smaller ones, the first of which would take its place in case of accident. The poison-fangs are carried drawn up to the palate, and are erected at will, for striking, by means of muscles which move the jaws in which the fangs are set. These snakes all bring forth young alive, and are therefore strictly *viviparous*—hence probably the term *viper;* though, from the fact that eggs are really produced and are retained in the body until they are hatched, the term *ovo-viviparous* is used in preference to denote this strange condition. With the exception of a few other forms, such as the sea-snakes, the other snakes are *oviparous*. The Crotaline snakes, such as the bushmaster *(Lachesis mutus)* of which some poor dried specimens alone are to be seen in the

Museum, the labarria *(Trigonocephalus atrox)*, and the rattlesnake *(Crotalus horridus)*, of both of which species, spirit specimens have been already noticed in the case, are the most to be feared, and the deadliest in the colony. They are peculiar from the fact that they have a pit on each side behind the nostrils, from which they have obtained the name pit-vipers—a character that is used to mark the family *(Crotalidæ)* to which the American vipers belong. The horny rattle at the end of the tail of the rattlesnake is well known. Both the bushmaster and the labarria shew horny spines, representative of this rattle, at the end of the tail, and the spine from a labarria is shewn in the case. It is almost needless to say that this horny spine is perfectly harmless. The *fangs* alone carry death—the forked tongue, which is popularly called the sting, being also a perfectly harmless organ.

The poison of snakes is but a modified form of saliva or spittle, and the glands modified salivary glands, from which the secretion is forced out by the pressure of muscles during the opening of the mouth. The channel in the fang is never a real perforation of the tooth. It results from the folding of the sides of the tooth, so to speak; and the line of union of the edges is always more or less visible in the tooth. In the poisonous Colubrine snakes with erect fangs, such as the cobras and the poisonous coral snakes, the tooth is only grooved to form a poison-channel: in the vipers, the edges of the groove unite and form a closed channel.

The visitor having now inspected the various classes of objects, it might be advisable to sum up the position of the various kinds of animals in the scale of organisation.

After the very simple forms of the Animalcules which are at the bottom of the tree, so to speak, and of which no specimens are exhibited, the group of the sponges is placed; and following this group, though not proceeding directly from it, comes the class of the Zoophytes *(Hydrozoa)*, while above this is placed the class of the corals and sea-anemones *(Anthozoa)*. Above these spring the great groups of the Worms *(Vermes)* comprising some very simple forms and others very complex. From these, in one direction, branches off the class of the star-fish and sea-urchins *(Echinodermata)*; in another, the great group of the joint-footed animals *(Arthropoda)*, comprising the insects, crustaceans, arachnids, and myriapods; while in a third direction, proceeds the great group of the shell-fishes *(Mollusca)* comprising the *Polyzoa*, and the various classes of shell-bearing molluscs. All these forms, so far, belong to the great sub-kingdom of the Invertebrate animals, that is, those destitute of a back-bone. To the worm-like stem belong various animals which present affinities to the lowest or most rudimentary of the Vertebrates. The great class of fishes *(Pisces)* forms the lowest division of Vertebrates, and close upon this comes the class of the frogs and toads *(Amphibia)*. Next is placed the class of the reptiles *(Reptilia)*, and then the birds *(Aves)*; while above this comes the great class of the milk-secreting animals *(Mammalia)*, whose highest characteristics culminate in man, as the "flower of the ages."

The animals of British Guiana correspond generally with those of other parts of South America and with those of tropical North America. So closely do the animals of these districts resemble one another, that the whole area

is ranked as one large zoological district, known as the Neotropical region, characterised by the peculiarity of its animals, which are allied to, but markedly different from, those of temperate North America, which is ranked as a separate region; while the Old World is divided into four separate regions. In the Neotropical, as in the other regions, there are certain districts which, though possessing forms generally corresponding with each other, yet are peculiar owing to the occurrence of other special forms localised in each. Thus this province is divided into the following sub-regions. (1) the tropical American sub-region, north of Panama and south of central Mexico; (2) the West Indian sub-region; (3) the temperate South American sub-region, including the districts south of Brazil and west of the Andes from Peru; (4) the tropical South American or Brazilian sub-region, which includes Brazil, Guiana, Venezuela, Ecuador, Columbia, etc. In this last sub-region there is a marked uniformity throughout—the animals being identical in all essential respects with those exhibited in the cases in the Museum as occurring in British Guiana—and while certain special forms are limited, or seem limited, to special areas, it would be rash to conclude, considering the vast districts throughout the sub-region which have been very superficially, or not at all investigated, that such forms are all certainly localised and have no wider distribution.

Up to this point, the visitor, if he has followed the account, has been gradually putting himself in the debt of the Museum, for information given—and there is only one method possible by which he can free himself, and that is, by affording the Museum the means of giving still

further information. From the foregoing pages, it is obvious that there are in the colony scores and scores of desirable objects which must be added to the collections to make the Museum as it seeks to be, a representative institution ; and if the benefit of hearty and active co-operation, from high and low, and from rich and poor, were given to it, the time would not be far distant when it would be possible to point to it as being an institution reflecting the highest credit on the colony that supports it.

NOTE.—Since the foregoing has been in press, the following interesting additions have been made to the collections :—

1. A sample of *Saccharine* or carbolic sugar, which is exhibited with the other coal-tar products. This substance is more than 200 times sweeter than ordinary sugar, and can be used in many cases where ordinary sugar is not advisable for the human subject.

2. A very fine and rather large quartz crystal from the top of Mount Roraima. The specimen is a clouded quartz, and shows clearly the hexagonal prism. It was taken from the water at the bottom of one of the basins, which are followed out in the sandstone, by Mr. DRESSEL, who a few weeks ago ascended the mountain. These crystals form a portion of the ordinary loose mass at the bottom of these basins. The specimen is shewn near the specimens of gold in the mineral case.

3. The skull of a poisonous snake (Labarria, *Trigonocephalus atrox ?)* which well illustrates the structure of the skull of the Viperine snakes as described in the foregoing pages. The preparation has been made from a somewhat damaged and dried up head. On one side, the

skin is left to shew the nostril, the Crotaline "pit," the eye with its large scale over it, and the small scales on the top of the flat head. One of the main fangs (the left) is broken and shews clearly, in section, the real cavity of the tooth, and the poison-channel formed by the fusion of the edges of a groove along the tooth. The edges of this groove are unfused at two points; firstly at the top, where the poison enters the channel from the poison-gland, situated under and behind the eyes; and secondly at the bottom, at some distance from the point, where a long and narrow slit allows the poison to be ejected. The reserve-fangs, the first a very large one, are also well shewn in position; the specimen is shewn close to the skeleton of the yellow-tail.

4. A skeleton of a Salempenta (lizard), placed by the skeleton of the yellow-tail snake for comparison. The structure of the skull, the limbs, and the arches, to which the limbs are attached, claim attention.

Fruit and Vegetables.

By the Revd. John Foreman.

THE growing of fruit for home consumption and for exportation, is exciting considerable attention in various parts of the world. There seems to be almost everywhere, a growing appreciation of the value of fruit as an article of human food. The rapid communication now possible between one country and another, brings the fruit-grower, and large masses of people living in towns and cities who are eaters of fruit, into connection, the one with the other; and this facility of transit, as well as the low price at which the fruit is sold, has caused a greatly increased consumption of fruits during the last quarter of a century. A few years ago the Right Honourable W. E. GLADSTONE, when Chancellor of the Exchequer, estimated the value of fresh fruit imported into the United Kingdom of Great Britain and Ireland, as exceeding in value two millions of pounds sterling every year. It is probably much more now. In this colony the inhabitants do not eat anything like the same quantity of fruit as those persons do who live in some of the West Indian Islands so near to us. At present British Guiana is behind some other colonies, both in the quantity and quality of the fruits grown in it. What little is produced, is too often grown without any care being taken to see that the seed, or the young tree, is of a good stock; and when planted, the tree is allowed to grow or not, pretty much as it pleases, very little

attention being paid to it, and such operations as manuring, pruning, training and grafting being almost unknown, or if known, neglected. There is in this question of the growing of fruit, a wide field in which the authorities of the Botanic Gardens might do a good deal for the public benefit, viz., by obtaining, rearing, and selling some of the finest kinds of fruit-trees grown in this and the neighbouring colonies; and by the giving information in untechnical language, as to the nature of the tree, its requirements, and the best method of its cultivation so that the fruit-bearing properties of the tree may be fully developed by its possessor.*

I have heard it said by a gentleman of the medical profession, who has practised many years in this colony, that a large number of persons,—especially Europeans, and persons born in temperate climates,—residing in British Guiana, eat too much animal food, and not nearly a sufficient quantity of vegetable productions, or of fruit.

In the "good old Dutch times," the middle walk of the estate was often planted from one end of it to the other, with a variety of fruit-trees, whilst the dwelling-house stood in a garden in which fruit-trees of many different kinds were grown. So that these planters must have been greater consumers of fruit than those

* It must be pointed out, in this connection, that a perusal of the annual reports of the Government Botanist, shews that a good deal is being done at the Gardens in this direction, though, unfortunately, except through the chance re-publication of these reports in the newspapers, the general public are little the better for the information. These valuable reports, treating as they do of many points of economic importance, do not get the wide distribution throughout the colony from the State, which they not only merit, but which the needs and circumstances of the colony necessitate—Ed.

who have followed them as colonists, have shown themselves to be.

The Editor of the *Horticultural Times* has published the results of a series of enquiries into the relative consumption of vegetables and fruit in the two great cities of London and Paris. From which we learn that whilst each Londoner eats yearly, one hundred and seventy pounds of potatoes, the Parisian consumes only forty-nine pounds.

From the Blue-Book of British Guiana for 1886, it appears, that nearly thirty-six thousand hampers, baskets and barrels of potatoes, of the value of forty thousand, three hundred and sixty-eight dollars, were consumed last year by our population of, say, two hundred and seventy thousand persons. In addition to the foregoing there were also imported, seven thousand, five hundred and seventy-two packages of "ground provisions", valued at eleven thousand, four hundred and fifteen dollars.

The Londoner also consumes thirty-three pounds of onions every year, whilst the quantity used by the Parisian is only four pounds. Garlic is largely used for flavouring purposes in France, and this may somewhat account for the great difference in the consumption of onions by the inhabitants, respectively, of Paris and London.

In this colony last year, seven hundred and sixty-four thousand, two hundred and thirty-four pounds of onions were used, being upwards of three pounds per head of the whole population.

In the purchase of cabbages, turnips, and cucumbers, the Londoner is also far ahead of the Parisian. But when the heading "Tomatoes," is reached, we see that the tables are turned, and the supply for each inhabitant

of Paris is fifty-seven pounds yearly (a little over a pound weight each per week), whilst the population of London consumes only seventeen pounds weight of tomatoes per head in twelve months. In short, potatoes seem one of the favourite vegetables of the Londoner, and tomatoes that of the Parisian. A walk into the Stabroek market will speedily convince any one that a number of different kinds of tomatoes are grown here; and in this also the Botanic gardens might be of use, in ascertaining, and propagating the very best kinds, and also by explaining how best to rear them. That they are a very valuable vegetable, or fruit, is quite certain.

Of apples, pears and other fruits, the consumption in Paris per head of the population, far exceeds that in London· Each Parisian is estimated to eat in a year, one hundred and forty-five pounds of apples. One hundred and seventy pounds of pears, and about two-hundred weight of plums, strawberries, raspberries and cherries. The Londoner, on the other hand, is content in the same period of time with sixty-five pounds of apples, thirty-nine pounds of pears, and about a quarter of an hundred weight of plums, cherries, strawberries, raspberries and currants.

Apples from the United States now form one of our regular imports, and find purchasers among all classes of our population; but the quantity so imported, and also of pears, and grapes, does not appear in the records contained in the Blue-Book.

From the foregoing it is evident that the inhabitants of the much colder cities of London and Paris, partake every year of a much larger quantity of fruit than do the residents in the tropical city of Georgetown, British Guiana.

On Disputed Titles to, and Squatters on, Crown Lands, Essequebo River.

By Michael McTurk.

THE importance of finally and definitely settling the claims of persons to lands in the colonies is becoming daily of greater importance, and there are not wanting instances where serious consequences have been the ultimate result of delaying the matter—the most recent instance that I am aware of, being the rising of the half-breeds under LOUIS RIEL in North-western Canada. I am aware that there are many who will entirely disagree with me in my views and who may be thought to have an equal, if not greater, experience of the places and class of persons to whom I shall particularly refer; and others again, who, although they may never have seen either the places or people referred to, and are almost unacquainted with the conditions connected with the first, and entirely ignorant, except from hearsay, of the nature and dispositions of the latter, yet may with a ready pen and fluent expressions make out very fair reasons to support their assertions. I must request my readers to bear in mind, however, that theory and practice do not always agree; and I base my statements on no theoretical suppositions, but on facts confirmed by experience, and I do not fear to call on the unbiassed opinion of those who, like myself, have had the opportunity of a long continued residence among, and an intimate acquaintance with, the persons and localities referred to, to confirm my statements.

In the founding of all new Settlements, colonisation must be encouraged; and in order to make them more permanent, plantations are established—their founders generally having a proprietary right, held from the Crown, or Government of the Settlement, on certain conditions, the objects of which are the cultivation of the soil, the opening up of the country, and the encouragement of persons to settle on the newly-acquired lands. Such was the case in this colony, and on the Essequebo, to which river I particularly confine myself. The conditions, in general, were that the holders of the land should not sell or alienate the same without the consent of the Government, and to them in all cases should be given the right of preference; and that the land should be put into cultivation and suitable buildings erected thereon. In no single instance have I heard of the land being granted for the purpose of woodcutting only. The Government also reserved to itself the right of cutting the timber from the lands at any future time that they might require it.

In most cases the boundaries of the lands so granted were very loosely defined. In one case, that of Groote creek, the limit inland from the river is along the course of the creek as far as the water "runs upwards." As the creek is a tidal one, this would appear to be to the head of the tide, but the point has never been settled and has been the cause of innumerable disputes. The façade is entirely undefined. In other cases the depth inland is stated as "—— feet," and the facades equally undefined, or the facade may be stated as extending from one creek to another, the names of the creeks being given. This seems definite,

but whether the nomenclature has been changed, or, by some freak of nature these creeks have become obliterated, I cannot tell, but at present many of them do not exist. Some of these grants are of great extent; and the conditions under which they were originally held, however they may have been complied with by the last grantees, are, without exception, entirely ignored by the present claimants, and the only purpose for which the lands are now used, is the denuding them of their timber—a right which, in the original grants, the Government reserved to itself.

In certain cases the claimants are numerous, notably so in the case of the Groote creek, where the legitimate and illegitimate descendants of the original grantees have alternately, and sometimes together, exercised proprietary rights. This place was in the first instance granted by the then Governor and Commander, HERMANUS GELSKERKE, to CORNELIUS BOTER, who was a member of the Council. The boundaries, as already stated, were undefined, beyond the distance inland as far as the "water runs upwards." The conditions were that the land should be cultivated in any way most profitable to the grantees; a suitable house was to be erected thereon; slave labour was not to be employed; and on the arrival of a Surveyor in the colony the place was to be surveyed. As in all other cases, the grantees were not to sell or alienate the lands without the consent of the Government, giving it always the right of preference; while the Government reserved to itself the right of cutting the timber off the lands at any future time. Excepting that the land has not been sold or alienated, the conditions have been entirely ignored and might never

have existed, and the only use the grantees have ever made of the land, has been, within the last forty years, to entirely denude them of all valuable timber—either by cutting it themselves, or allowing others to do so on payment of a royalty on the quantity cut.

The title to Groote creek was one of those investigated by the Commissioners in 1854, and the only documentary evidence the claimants could produce was what purported to be a copy of the original grant by GELSKERKE, but GELSKERKE had been dead fifty years prior to the date of this document. The Commissioners in their finding say that, allowing this to have been a clerical error, the conditions of the grant have never been complied with, and conclude by saying the Government should resume the land. This has never been done, and the conditions of the grant are being openly ignored, while the boundaries remain as undefined as ever.

In another instance, a piece of land was claimed by the late CHAS. BENJAMIN, then proprietor of Pln. *Spring Garden*, but the Commissioners decided against the claimant and made some very severe remarks on Mr. BENJAMIN'S evidence. Notwithstanding this, Mr. BENJAMIN, soon after, by a 'Deed of Gift,' made over this same piece of land to a young relative, who some time after, acting in good faith, on the authority of this document, commenced to work on the land, only to leave it very shortly, owing to complications with another claimant and the Government.

In yet another instance (an island near the mouth of the Essequebo), the grantee left the colony many years ago, and died in the United States. Previous to leaving he had appointed an attorney. This attorney died some

time after; and the daughter of the attorney claims the island as her own, and exercises all the rights of ownership by cutting wood and renting a part of the land. Other instances are numerous; but, as examples, those mentioned are sufficient.

Formerly when timber was of little value—that is, until greenheart was brought into notice in England, principally I believe by the late DR. RODY,—very little attention was paid to these lands by any one who had a claim or supposed claim to them. Afterwards, as these lands were still in their original state, and were covered with forest, their value came to be recognised; and, ignoring the conditions under which they were granted, the descendants of the original grantees commenced woodcutting operations unopposed—operations that were carried on until the lands were stripped of their best timber, when, with this exception, the places were left as they had been before timber-cutting began.

It is a well known fact that the interior lands of the colony are not very fertile, and this interior land extends to within a comparatively short distance of the sea coast; and until the population of the colony becomes comparatively dense, this land will never be cultivated in any other than the present imperfect and intermittent mode by the squatters and Indians.

The squatters on the Essequebo are comparatively few at present, and are nearly all illegitimate descendants of the early European settlers by Indian or negro women; and however energetic and industrious their forefathers may have been, their descendants by the further admixture of principally African and Indian blood, have succeeded in entirely obliterating all traces to such

a disposition in their character, and for idleness and improvidence can compete with a South Sea Islander. Many of these persons are living on land originally granted to one of their forefathers as a grant of occupancy during the pleasure of the Crown, or for a term of years, or under a woodcutter's licence for a fixed term, and in most cases a yearly rent of so much per acre was payable. In all cases the wood-cutting licences have determined, and the acre-money due on the grants of occupancy has not been paid for very many years.

At certain intervals an advertisement appears in the newspapers that such and such a grant has determined for certain reasons; but as those occupying the grants referred to never see the newspapers, and as the terms are never enforced, they remain where they are, and thus perpetuate and multiply instances for after settlement. These squatters act as though they were the *bona fide* owners of the lands they occupy, and in some cases allow others to cut timber or squat on a part of the land on payment to them of a consideration; and they and their descendants, as they increase, will eventually be the cause of much trouble and litigation. The matter is therefore eminently worthy of the attention of the Legislature.

Much has been said of late about the encouragement of small industries, and some advocate the selling of the Crown Lands at an almost nominal value and in small quantities. Were the class of persons, who are likely to become the purchasers, of an industrious habit, and were they likely to benefit themselves and the general public by cultivating the land of which they became the

proprietors, and thus in a manner opening up the country by extending civilisation, I should say by all means do so. But are the people so disposed? What has been the experience of the past? Do those who now as squatters occupy the land which some propose they should occupy as proprietors, do anything to contribute to the general welfare of the colony? Do they cultivate a sufficiency of provisions for themselves, with a surplus for sale to provide themselves with decent clothing and other articles necessary to the comfort, nay to the existence almost, of civilised persons? Is it not a fact, rather, that they cultivate merely sufficient for their individual consumption, and when they require anything more than the produce of their cassava field, that they steal and sell the timber from the ungranted Crown Lands to acquire means for the purpose? It may be said I am harsh in my remarks on these people, but I am confining myself to facts and putting aside all sentiment for idleness. The facts are not altering as I write, and are not likely to do so for many a future day. What would it benefit to even give to such people, free of all cost, portions of land, say of five, ten, or even fifteen acres for each family? It is a well-known fact that they never continue the cultivation of any spot they have cleared after reaping the crop of cassava off it, but cut a new clearing every year. To those unacquainted with them, this would seem an extraordinary process, and one entailing unnecessary labour; but cleared land gathers weeds and grass, and requires much weeding. This means labour, a thing they are averse to, and so they make a new clearing every year and burn it off, and before the weeds and grass become too rank the crop is off, and a

new field can be cut for next year. Irrespective of the damage done to the forest, it is plain that such a process will soon exhaust any small area of land, as land once cleared and left to itself soon becomes thick with grass, vines and thorny bushes that keep down the forest growth; and as much as twenty years will elapse before the same land will be cleared again for cultivation. Even this, however, is not done if it can be avoided, since the clearing of 'Mainoh bush', the local name for old clearings, is more troublesome and requires more labour than the cutting down of the original forest.

Some may remark that where land is of comparatively little value a few squatters more or less can do no particular harm, and that the country is covered with forest. To this I reply that the example is a bad one, and exceptionally so in a colony like British Guiana where such large sums are annually spent on the importation of mmigrant labour; and particularly so at present, when, in order to enable the sugar-producers of the colony to merely keep on an equality with other sugar-producing countries, all possible and legal means to prevent idleness and consequent waste of our scanty supply of native labour, are imperatively necessary.

Although the country may be covered with forest, there are only certain kinds of timber that are merchantable, and the extent of country from which it is derived is a limited one, owing to the short distance inland for which our rivers are navigable. The timber has already fallen off in value and quantity, for this area has already been cut over twice, and in some cases thrice; and no legal restrictions exist on the subject.

It must be remembered that my remarks are entirely

confined to the lands and squatters on the River Essequebo. There may be similar conditions existing in other parts of the colony, but, not having any personal knowledge of them, I am not competent to remark upon these.

I think it would be an easy way to settle these claims if a Commission was appointed, somewhat similar to the one appointed by Governor WODEHOUSE in 1854, to enquire into, and report upon, the titles to lands on the Essequebo, Mazaruni, Cuyuni and tributary streams,—but with this difference, that the Commissioners should have power to enforce their finding. More than this, the Crown Lands Department should, in all cases, not only assume actual possession on behalf of the Crown, where the finding of the Commissioners shewed that the land, the title to which was in dispute, was not being legally occupied, but should also not allow the claimants to remain in possession, nor to hold their title in default of actual resumption of occupation by the Crown.

Due consideration should be given to persons, in the actual occupation of lands, who are beneficially occupying them for their own and for the public good. To these, a definite and indisputable title should be given, and all further question as to ownership be thereby finally determined. The areas and boundaries of their lands should be distinctly stated and defined, and no such vague expressions used, as has hitherto been the case. When persons are not occupying the lands, or are doing so by merely allowing a few squatters to reside on them, the lands should revert to the Crown, instead of being allowed to remain, as they are at present, a sort of no-man's property, claimed by both the Crown and

the squatters, and, as time goes on, giving rise to complications as to the ownership more and more difficult of final solution.

Many will no doubt assert that times have changed, and that the conditions of every thing are different from what they were when the lands were first granted, and that the terms and reservations under which they were granted are no longer applicable; but it would be advisable for those who would make such assertions to make themselves acquainted with the original conditions and reservations and their object. I think, if they do so, they will find it difficult to modify them in favour of the grantee, and that they are quite as applicable now as they were formerly, and perhaps more so.

Europeans, with very few exceptions, cannot endure actual outdoor labour in this colony, and no one with a small capital will be inclined to risk it in trying any new industry inland where the supply of labour is a certain uncertainty. Under the present system of Immigration no encouragement is given to beginners, for, unless a person has capital enough to commence operations on a very large scale and in a populated district, the requirements of the Immigration Laws will prevent him from employing indentured immigrants, who are well known to be the only regular labourers to be relied upon.

Squatting should be firmly repressed, and carefully guarded against There are not wanting others than the half-breeds, who, under the present lax manner in which the law is enforced, are ready to occupy the Crown Lands, and indeed already do so, leading lives of immorality and idleness, and to whom the word "work" is a

"cuss" and the offer of employment an insult. One of the provisions of the Crown Lands Ordinance is that a person who has been residing undisturbed for twelve months on any Crown Land can not be removed but by process in one of the higher Courts; and as no one seeks to disturb the settler, this is an invitation to idlers to occupy the Crown Lands, and the proviso might with advantage, both to the colony and the idler, be erased from the Ordinance. Were the land more under the immediate supervision and care of the Government, it might be profitably occupied as grants, and become a source of revenue to the colony; while the idler, having no harbouring place, would be forced to work for his livelihood.

*Rice Cultivation in British Guiana.**

By A. R. Gilzean.

SOME twenty-two years ago an East Indian immigrant on Plantation *Leonora*, cultivated about twenty acres of the front lands of that estate for the growth of rice. He used a bullock-plough for the preparation of the land, and, as far as I can remember, he succeeded in raising good crops. After working for a couple of years he abandoned it, but for what reason I do not know. I do know, however, that the proportion of the crop which he gave the estate, in the shape of paddy, as rent for the land, was not cleaned for use. Labour was so dear then that it did not pay to clean the rice. About the same time an experiment was made in rice-growing on a large scale at Plantation *Vive-la-Force*. It failed owing to the difficulty and expense of the cleaning operation. A machine was imported for the purpose, but like all the small rice-cleaning machines of which I have ever heard, it was not a success.

The East Indian and Chinese immigrants in various parts of the colony, have from time to time planted rice in the estate's navigation trenches and the open savannahs, but with varying success, meeting with great discouragement through the loss of crops from floods and drought.

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* The following paper on one of the most promising industries of the colony, forms a most useful and valuable supplement to a former paper, by Mr. Russell, on the same subject, published in *Timehri*. vol. v. pt. 1, 1886.—Ed.

Sixteen years ago the Chinese on Plantation *Anna Regina* obtained leave from Mr. G. H. BASCOM, the manager of the estate, to tap a pipe which supplied fresh water to the factory. With this means of irrigating five acres of low land adjoining their dwellings, they succeeded in raising excellent crops of rice; and, from that day to this, this piece of land has been diligently cultivated. It has yielded on an average three crops of rice a year; and with no rotation of crops and no rest, the land shews no falling off in yield after all these years. No rent has ever been charged for this plot, nor has any charge been made for the supply of water, so that the only deduction that could be made from the success of its cultivation, was, that such land with such a supply of water could be made to yield excellent crops of rice with the utmost regularity and perfectly independently of seasons.

In 1884 I induced two free East Indian immigrants to lease 30 acres of the adjoining land at a yearly rent of six dollars per acre. They sub-let the land in lots of a quarter of an acre upwards. The cultivation was so successful that applications for more land soon began to pour in; and although I raised the rent, including of course a continuous supply of fresh water, to twenty-four dollars per year an acre, I soon had nearly 300 acres taken up. Contracts were entered into with a large number of free immigrants living in the villages in front of the estate, giving each man half an acre, at half price, on condition that he worked on the estate, when called on, for 3 days in a week at current rates; and this arrangement worked most satisfactorily for some time. At the time that so much land was taken up, wages were very

low, and they continued to be comparatively so until the very heavy season set in at the end of last year, when the sugar estates had to raise wages to attract labourers to re-establish the cane cultivation which was nearly drowned out. At the same time the rice-growers were suffering from a plague of rats which were doing great damage to their crops. The consequence was that the rice cultivation was practically suspended for about six months. When, however, wages became normal, the labourers again turned their attention to rice, and to-day over 100 acres are in full cultivation, while every day some more is being planted. Very little labour is required to re-establish the cultivation of a bed which has ever been prepared for rice, and the lease of such a bed although subject to rent, with no cultivation on it, is a marketable commodity.

Mr. WINTER, the proprietor of *Coffee Grove*, has leased a good deal of his front lands to immigrants for rice cultivation, and it presents a very handsome and healthy appearance. I have heard of no other systematic, or comparatively permanent attempts at rice-growing on a large scale in the colony. No doubt a large quantity of rice is raised in the savannahs, and in some instances with good results; but the difficulty of regulating the supply of water must be ruinous in many cases.

Having given this sketch of the districts of the rice industry in the colony to the best of my knowledge, I now proceed to describe the mode of cultivation, with its cost. The front lands of *Anna Regina* and *Coffee Grove* on which rice is grown, are very low, their average level being 50 Georgetown Datum, or about 2 feet under the level of the water in navigation trenches. The

trenches are supplied with water from the Tapacooma lake, and the supply has never failed. The fields were formerly in cane cultivation, but the land was not suitable for it, as the canes used to suffer from the slightest drought. The preparation of the land for rice necessitated the filling up of the old drains, and the formation of little ridges or smouses, about 18 inches wide and 6 inches high, separating each man's lot from his neighbour's. This is done by agricultural forks and shovels, and costs about $15 an acre. When a plot has been roughly levelled, water is let on to it from the navigation trench, and the whole surface is then thoroughly levelled and puddled, at a further cost of $5 an acre. It is then allowed to remain covered with a few inches of water until all the grass and weeds are killed out. In some convenient corner, a patch of about 10 feet square is raised a few inches above the water level, and the ground is thoroughly pulverized ; and to give plants for an acre, this patch is thickly sewn with 6 gallons of paddy, costing 72 cents. In 4 weeks it gives a thick growth of young rice-plants about 12 inches high, having been carefully watered every day. The plants are then pulled up by the roots and tied into bundles. The seedlings from these bundles are stuck by hand into the mud in the levelled plots, two or three together, about 10 inches apart, with wonderful regularity, and they present the appearance of corn sewn with machines in other countries. It takes a man 16 days to plant an acre, and a day's pay for this work is 32 cents. After the transplanting, no further care is given beyond attending to the supply of water which should cover the ground an inch in depth, until the grain ripens. This happens about 3 months after

transplanting. When there were only a few acres in rice on *Anna Regina*, some one had to attend to each patch all day to keep off the birds while the grain was ripening; but since the cultivation has been extended, this has become unnecessary, as the birds do not seem to have increased in numbers—at all events, in no proportion to the cultivation. When the rice is ripe, the ears are picked with the top of the stalk, the straw being left standing. The cost of this operation is \$2.40 an acre. The yield of the first crop is more uncertain than the following ones, but the average may be safely put down at 20 bags of paddy, each weighing 100 lbs. The grain is threshed out on a piece of levelled ground covered with hard mud, and it is separated from the husk by dropping it slowly from a height of 3 or 4 feet in a light breeze. This costs 4 cents a bag of paddy. Up to this time no rent is paid for the land, and the cost of the first levelling is capital which can always be recovered by the first occupant of a bed from the next one, so I take neither of these items into account in estimating the profit of the first crop.

The value of 20 bags of paddy is ...		\$ 38 40
The cost of procuring them,		
Final levelling and puddling	\$ 5 00	
Plants	0 72	
Transplanting	5 12	
Attending to water supply, &c. ...	3 00	
Reaping 20 bags at 12 c.	2 40	
Threshing & winnowing	80	\$ 17 04
Shewing a profit, on 3 months' work, of ...		\$ 21 36

Sometimes the straw is cut down close to the ground, and a second crop allowed to come up from the old roots, but it gives a poor yield; and as a heavy rent

has to be met after the first crop, this second crop is seldom taken. Instead of that, the straw is cut off, and the roots hoed up and puddled with the feet, the operation costing about the same sum as the final levelling for the first crop. The ground is now ready for the reception of fresh plants which have been grown in the nursery in anticipation; and the transplanting and following operations are the same as were those for the first crop. The monotony of these operations is never varied, and one crop succeeds another, as the years roll on. The return from an acre is about 20 bags of paddy from each crop; while three crops can be grown comfortably in a year. As the rent for each crop would therefore be eight dollars, this would still leave a profit of $13.36 a crop.

These calculations are made on the assumption that the land is worked by hired labour, whereas it is usually done by the lessee in his spare time. A good man can thoroughly cultivate half an acre of rice in 100 days a year. The work is very congenial to East Indian immigrants, and the regular supply of water is a great charm after their experience in this respect in India. For comparison with what I have written about their constant supply of water, I will quote what H. B. PROCTOR writes in a pamphlet on rice, reprinted from *The Miller,* 1882, with reference to the crop in Burmah:—

"Where so much depends upon rainfall it is no exaggeration to say "that an inch or so of water, more or less, determines whether the "receding flood shall leave a bright fertile plain full of promise, or a "ruined waste of drowned and rotted crops. With a late and heavy "monsoon, thousands of acres are sometimes submerged and the crops "ruined; should the floods, however, not be too late in the season, the "ground is replanted a second time, and sometimes a third time, and "the cultivator possibly saves his harvest. In 1876-7 the crops were "ruined by floods over no less than 171,000 acres, entailing great suffer"ing on the people".

In that country only one crop is raised in a year, and as all of the planting has to be done at one time, a great strain is thrown on the labour market. Here, as I have stated, three crops can be raised in a year, and no attention whatever has had to be paid to the seasons. It is not at all uncommon to see here one acre with four or five crops of different ages on it.

The limits of this article do not allow of my going very deeply into the question of rice-cleaning. It is done here by pounding the rice in a mortar, the pestle of which is attached to a lever worked by a man's foot. The cost of converting two bags of paddy into one of very well cleaned rice, is about two shillings. I have gone to a great deal of trouble in searching for a machine to clean rice on a comparatively small scale, but can hear of none that is working satisfactorily. Some idea of the difficulty of constructing such a machine may be gathered from the following list of separate and distinct machines used in a rice-cleaning mill in Liverpool: Sieve and Aspirator, Shelling Stones, Scouring Machines, Blower, Decorticators one or more in succession, Blower, Polishers in succession, Blower, and Sieve. The Liverpool rice-mills are not constructed so as to be able to deal with paddy. What is cleaned there is called "cargo rice," which is about four parts of clean rice and one part of paddy. All of the cargo rice is shelled and milled in large mills at the rice ports in Burmah, India, &c. When enough rice is grown in the colony to meet its consumption of 250,000 bags, there will be plenty of work for a good mill, but until then I fear we must keep to the primitive "stamper-pot," as the rice mortar is called.

There are infinite varieties of rice (over 200 at all events) cultivated in different parts of the world. In England about 92 per cent. of the consumption is obtained from India, and last year it was worth about 6/6 a cwt. in the shape of cargo rice. The other 8 per cent. is obtained from Patna, Java and Japan, and was worth last year about 12/ a cwt. A sample of the rice grown on *Anna Regina*, which is the same as that grown almost universally in this part of the colony, was cleaned in Liverpool and shewn there in the Exhibition of last year. It closely resembled the finest samples of Java and Italian rice, which are considered the most desirable; and it was very highly thought of by the miller who reported on it. He thought it was wasted in feeding the labourers here who would not appreciate its value, as the English consumer would, at double that of ordinary rice. For some reason, which I have not been able to discover, this kind of rice cannot be grown in the great rice-producing parts of India. There is no difficulty whatever about growing it here, and this is a very great point in considering rice as a future industry of the colony. When one considers the difficulties under which rice is made to pay in other places, it seems likely that it would succeed here on the low lands that have a supply of water for irrigation. Having seen the disappointment caused by the want of a sufficient supply of water, I should always be particular in ascertaining before giving out land for rice cultivation, that it was below the lowest level of the canal from which it is to be supplied with water.

Whether or not the cultivation of rice in this colony will ever stand as an industry by itself, there is no doubt

whatever that it is a very desirable adjunct to cane cultivation. Now that there is a tendency to concentrate the season for reaping canes into a few months at the end of the year, there is some difficulty in finding employment for the gangs in the slack season. Rice-growing seems to be the very thing to meet the difficulty, since a crop can be taken off in such a short time. As I have shewn, a good crop of rice can pay a heavy rent and give remunerative and congenial employment to the labourer; and the profit which is made on a good crop is quite sufficient to counterbalance the chance of a bad one.

Steam cultivation, and reaping and threshing machines, may be enlisted in the development of the industry, and it may some day become the great industry of the colony. The formation of the coast lands is eminently suited for it, and the only thing that is required is a constant supply of water for irrigation.

Books, and their Enemies.*

By James Rodway, F.L.S.

THAT so many old books exist to-day, is a proof that our ancestors took greater care of them than is taken by the present generation of readers. It is very difficult to keep a Library in good condition in the damp climate of British Guiana, where myriads of insect pests are always ready to destroy the books; but, that it is not impossible, I will endeavour to prove. That many valuable old works have been destroyed in this colony, through want of care and attention, is shown by the dilapidated state of those which are commonly sold at Auction, and also by the great scarcity of local works, which must have had a large circulation at the time of their publication. As it is of some importance to our descendants that our local literature should be preserved, the following notes on the destructive agencies which are continually at work in our Libraries may be found useful to book-lovers. It may be objected that no one will trouble himself to take all the precautions against damp and insects which are suggested, but, as there are probably a few genuine Bibliophiles in the colony, who like to have good books in good order, they will not mind a little care in preserving their treasures.

Whether the greatest injury is due to climatic influences

* Samples of books which have been ruined by insects, together with some of the insect pests, illustrative of this paper, are on view, for a limited time, in the British Guiana Museum.—Ed.

or to insects, is questionable. In the country districts dampness is very destructive, in fact, away from the winds of the coast, it is almost impossible to keep a few books in good condition during the rainy season. The covers become mouldy, the cloth separates from the sides, engravings become discoloured, and if the volumes are not well aired before the moisture has had time to develop mould, the leaves stick together and become a mass of rottenness. Black mould, blue mould and yellow mould, penetrate the substance of the paper, and if the back and covers have been pasted, they become the seat of a variety of fungi more interesting to the microscopist than to the unfortunate owner. A kind of mite *(Cheyletus)* is always found associated with mould from its earliest stages, but it does not appear to injure the book, while it is an indicator that the destructive agency has begun its work, and as such, ought to be noticed at once. In Georgetown there is not much difficulty in keeping the Library free from damp when suitable accommodation is provided. That books are being destroyed continually in the city however, the examples to be seen at Auction Sales very unpleasantly prove. Many of the Medical Practitioners keep their consulting rooms on the ground floor, and as the reference library is a necessary appendage, it is accommodated in the same place, in a bookcase or on shelves, against the brick wall. In such situations the volumes soon become mouldy, and even if not allowed to become seriously damaged, they are very disagreeable to handle. To read a mouldy book is one of the most unpleasant tasks of a student. Sometimes it will be several months before the nasty smell is dissipated by a thorough airing. A set of *new* books in my possession,

which had been taken up the Demerara River for a few months, were unbearable for reading till nearly a year after being brought back to Georgetown. I have several examples of the effects of damp and mould in my collection. One of the works being rather rare, I have taken some trouble to preserve it. For one-third of its width the leaves are thoroughly disintegrated, so that they chip off at the lightest touch, another has a crop of black mould between each leaf which soils the hands when touched, although it has been well aired for several years; to brush this off would break the leaves in pieces, and even the separation of one leaf from another is very risky.

To restore a rotten book is of course impossible, but it may be preserved if carefully aired and lightly handled. If valuable, the margins may be strengthened with tissue paper. When the volume is in its first stage of dampness, removal to a dry room, and airing of a few leaves at a time will prevent further progress of the destructive agency. Attention to the following points will prevent a recurrence of the trouble; first, never keep books on a ground floor; second, keep them well away from all walls, especially those of brick and concrete; and finally do not use closed cases. There are apparently some advantages to be gained by the use of well-closed book-cases, but taking everything into consideration, open shelves are better. However close the case may appear to be, the seams open in dry weather and moisture permeates when the first rains fall. Very soon the wood swells, the case closes so that the damp air inside becomes stagnant, and if not opened, conditions are produced which are very favourable to mould and insects. Book-shelves should be made without casings, and

in such a shape that they may stand on their own base without requiring to be rested against a wall. It is better to place the shelves so that the light may fall on the edges of the books, instead of on their backs, as the bindings will be preserved against bleaching by this arrangement, and there will be less harbour for the noxious insects who "love darkness rather than light". In such a position, with a free circulation of air on both sides, there is little to be feared from damp and mould, unless the shelves are on the ground floor.

Before leaving this part of the subject I cannot too emphatically condemn the carelessness of some of the publishers of the day in sending pasted and wire-bound books to a damp tropical climate. That such works as STEVEN'S "Flint Chips" and BODDAM-WHETHAM'S "Roraima" should be stitched (if it can be called so) with wire is simply disgraceful. The wire very soon rusts and the book falls to pieces, sometimes, before it leaves the booksellers. Authors generally desire that their works shall live after them; a little more attention to bindings would help in one way to that end. Many of the most elegant and showy bindings become unsightly in a few months, from want of attention to the fact that book-binders' paste decomposes immediately in a damp atmosphere.

Coming now to insects pests, the nastiest and most disgusting is the Cockroach. It is omnivorous, but has its partialities, among which nothing is so pleasant to its palate as the fancy bindings which decorate some fine illustrated books. The publisher sends it out in a gay cover with bevelled edges and a wealth of gilding, placing the volume in a card-board box to preserve it. But the

binding is pasted, and the cloth dressed with something which Mr. Cockroach fancies, so he flies from his lurking place after you have gone to bed, and the next morning you find your beautiful present covered with unsightly blotches. When a child sucks the corners of his picture-book, the effect produced is exactly the same as the work of this insect, but it by no means confines itself to the corners, on the contrary it goes over the whole of the exposed part of the cover, sucking out the dressing and exposing the rough fibres of the cloth. In preparing books for the tropics, the publishers should order the cloth to be finished by rolling, and only glue used in the binding. The cockroach not only attacks the cloth covers, but it eats the leather as well, and would probably find little difficulty in devouring the whole book if it could find nothing better. It makes very unsightly blotches on the edges, where it also excavates a hollow to fasten its egg-case, which it glues with a kind of cement, covering the case with the tiny bits of paper which it has gnawed from the hollow. When the book is consulted, about fifty pages are found fastened together, and after removing the case an unsightly pit remains. As rough edges are always more liable to the attacks of insects, a Bibliophile in British Guiana has to abandon his preference for uncut books and get them gilt-edged if he can afford it.

Wood-ants *(Termites)* are as destructive to books as to everything else that is not metal or stone. They live in darkness, and cannot exist on a well-lighted airy book-shelf. Old houses almost always have them lurking in the corners, ready to take advantage of a pile of periodicals, or a book-case placed against the wall, where

they can work unseen. These insects do not mutilate the book by nibbling, or spoiling the binding, or boring holes in it; they simply eat it entirely, as a hungry boy eats his thick slice of bread. Where, however, the books are a little too much exposed for them to work properly, they will get into the back between the stitching and the cover, through a book-worm's hole, or if there are folding plates which keep the volume from closing tightly, they insinuate themselves between the leaves. Once inside, they begin to mine; there may be apparently nothing wrong outside, but when you open the book you find a hollow filled with insects, which have eaten almost all the letterpress, up to the margins. By keeping the shelves away from the walls and giving a little attention to wormy volumes, the Library may be easily freed from this kind of Bibliophage. Some species of carnivorous ants are mortal enemies to termites; it has been even suggested that nests of ants should be introduced into or near old houses to destroy them, but as the remedy may be worse than the disease, such experiments should be tried very cautiously.

Book-worms are the larvæ of species of Death-watch *(Anobium)*, and one or more kinds of moth. The eggs are laid by the parent insect in any convenient crevice of the book, such as between the leaves when they are loose, or in the space between the stitching and the back. As soon as the larva is hatched, it begins to eat its way through one leaf after another until it gets to the cover, where it is sometimes turned back, but more often it will penetrate through one volume after another, to the end of the shelf. A case has been reported of seventeen

volumes perforated by one insect, so that a string could have been passed through the whole set. Where there are several larvæ they will perforate the volume in so many places that the leaves can hardly be opened and appear like paper lace of a very irregular pattern. If not disturbed the perfect insect is soon developed, and lays her eggs in the old tunnels, from whence comes a new generation of

"The Grub that grubs in Grub Street for its grub."

Some kinds of paper are very agreeable to these pests, while other varieties under similar conditions are untouched. Probably it would be found that papers made of straw, esparto grass, or wood-pulp are most attractive. It is supposed by persons outside the Tropics that only *old* books are attacked by worms. Such is by no means the case; some of the worst examples will be found among the publications of the last fifty years, and even new volumes on the shelves of the bookseller will be found perforated in a few months. As a rule, well rolled paper is not relished so well as that of a loose texture.

Two species of scale-moth *(Lepisma)* are commonly found among books, and more especially in drawers with loose papers. They are rather pretty insects, characterised by their long antennæ and three long tails, and are very active in their movements. The smaller species *(L. saccharina)* insinuates itself between the leaves of loosely-closed volumes, especially where there are folded plates, while the larger *(L. pilifera)* is more common among piles of unbound periodicals. These insects graze over the surface of the paper, not generally attacking the printed portion, until the leaf is irregularly perforated. In the case of folding plates they graze along the fold until it separates, so

that the picture is spoiled by being irregularly broken into two or three pieces. Dogs-eared books are very liable to be disfigured, as there is just enough space left by the fold to allow the smaller *Lepisma* to do its work. The scales of these insects are very beautiful microscopic objects, and are used as tests of the magnifying and defining power of good microscopes. Of the several kinds of book-pests mentioned, the cockroach and wood-ant prefer damp places, while, on the contrary, book-worms and *Lepisma* are more frequent in dry situations.

Other kinds of insects are found in the Library, such as spiders, centipedes, and scorpions ; these are carnivorous, and foes to cockroaches. It is not a very pleasant sensation to handle a scorpion, or to have a centipede crawling over your hand, when taking a book from its shelf, and therefore these may be destroyed, but spiders, especially the large kinds, which are the tigers of the insect world, should be encouraged. As they spin no web there is nothing unsightly in their presence, while the number of cockroaches and other vermin they destroy is enormous.

Whether a cloth or leather-bound book is most suitable for this climate is doubtful. If the former is used, it should be of a stronger texture than usual, and as before stated neither pasted nor dressed, otherwise than by rolling. Some kinds of thin leather (sheep and split skins) get a kind of dry rot very quickly and become quite brittle. A good calf binding is fairly durable, as is also morocco if poisoned. I always apply a solution of corrosive sublimate in spirit to all my books, whether cloth or leather. The strength is a quarter ounce to the pint of strong spirits, painted over back and sides.

The whitish appearance left by the poison can be removed, and the appearance of the binding much improved, by rubbing with vaseline. Old shelves may be painted over occasionally with turpentine or kerosine oil, and cloths wetted with the former placed in book-cases as preservatives against both mould and insects. By these means something can be done towards keeping a collection in order, but every book-lover who values his collection should overhaul it thoroughly at least once in three months.

The Guahivos.

By E. A. Wallace.

DURING the revolution in New Granada in January 1885, my business of plant-collecting being prevented by want of mules and muleteers, owing to the revolutionary authorities having stronger claims on their services than I had, I was led by curiosity to visit San Martin. This village which is situated near the head of the River Meta, (a tributary of the Orinoco) and about 20 leagues from the slopes of the Andes, bears the worst name for fever of all the towns and villages in the neighbourhood, and on this account has hardly ever been visited by foreigners. I was therefore very agreeably surprised to find it the cleanest, and apparently the healthiest place that I had visited. The inhabitants appeared to be well-to-do, and what is rather strange in this part of South America, not a single beggar could be seen.

While exploring the neighbourhood, I heard many tales of a strange tribe of Indians called Guahivos, who were living on the River Ariare about a hundred and fifty miles distant, some of whom occasionally visited San Martin. Having a little leisure I determined to pay these Indians a visit, and finding on enquiry what articles of negotiæ would be likely to please them I loaded my saddle-bags and started quite alone, followed by many an *Adios* from my acquaintances in the village, who never expected to see me again. The little that was known of this people, was gathered from a few Indians who had occasionally

visited San Martin for purposes of barter. The Spanish Conquistadores had never subjugated them, and it was commonly reported that no one had ever visited their habitations. As I held the same opinion as "Walking Stewart," that no tribe of people would wantonly injure one who unreservedly threw himself upon their hospitality, the gloomy forebodings expressed by my friends in St. Martin, had but little influence upon me. It was useless to look for a guide, nor did I want one. Their villages were known to be on the left bank of the river Ariare, which runs past San Martin, I had therefore only to ride down the broad savannah, keeping the forest of the Ariare on my right hand, and I must eventually arrive at my destination.

I set out from San Martin riding a good mule, and taking with me sufficient food for a few days, armed also with a double-barrelled breech-loader and a revolver, more as a means of obtaining food and as a protection against wild beasts, than as any defence against the Indians. After six hours riding I reached the last cultivation of the Columbians, where there lived a family engaged in the business of stock-raising—the only occupation on these glorious plains, so well suited for it—and here I passed the night. My host informed me that, after a ride of two hours from his house, I should meet a range of small hills, which divided the watersheds of the rivers Ariare and Manacacias, and that my best way would be to make my way along the ridge. Soon after leaving the ranch on the next morning, I came upon these hills, which formed a mountain chain in miniature; and never has it been my lot to visit a more lovely country. The central ridge was from two to three hundred feet above

the surrounding plain, and on either hand opened out most lovely valleys, each watered by its own little stream, whose course was marked out by the Æta palms, or Moriches, as they are here called. The grass too, with which the plain was covered, is of excellent quality, well suited for cattle. Along this ridge I rode for two days, all the time marvelling at the beautiful panorama spread before me. Game was in abundance and I had no difficulty in procuring more than I could eat. Each night the grass was my couch, as it was safer to sleep in the open plain than to sling a hammock in a belt of forest, since pumas and jaguars abound wherever the trees afford them a shelter. The third day I saw in the distance on my right a magnificent lagoon, but as it was fully ten miles away I had not time to visit it. On the morning of the fourth day I noticed that the ridge was taking me too much to the left, and that the forest of the Ariare was almost lost from view, I therefore descended once more to the plain and directed my course a little more to the right, and about noon reached a small village of the Indians, deserted apparently at my approach. The village consisted of two oblong open-sided benabs, and one *adobé*, or clay-hut, of the same shape, with a low doorway at each end. Having tied up my mule, I took out a few strings of beads, and looked about for any trace of a human being. On peeping into the adobé hut, which was very dark and clouded with smoke, I discovered an old woman, very infirm, with a sick child in a hammock. To each of these I gave a string of beads, with which they were evidently pleased ; but they were apparently scared, and it was not possible to make them comprehend anything

by means of signs. Soon two younger women came in; and these also received a string of beads. With them I succeeded better and they brought me a piece of cassava bread. Presently the others came in by twos and threes, till they numbered about thirty. All the men carried bows and arrows, and some a long blowpipe in addition. The arrows were about seven feet in length, and were furnished with a very formidable head consisting of a blade of bamboo, as sharp as a razor, and from twelve to fifteen inches in length, by two inches in width, appearing capable of making a fearful wound. Fortunately I had made enquiries in San Martin as to what the Indians particularly fancied, and had accordingly provided myself with some pieces of steel to strike on flint, some roughly made metal arrow-heads and some red and blue handkerchiefs. To all the women I gave beads, but with the men I could make but little headway until an old man, who was evidently their chief, arrived. Him I propitiated with a piece of steel and an arrow-head, with which he was childishly pleased. The others now crowded round, and to every man I gave some trifling present. Our only means of communication of necessity was by signs, which they were very quick to interpret. They were extremely curious about my coat, feeling it all over, and looking at it inside and out.

This encampment is a few hours' journey above the junction of the rivers Ariare and Gaviare and is situated at the edge of the belt of forest bordering the former stream. No one stopped in the houses at night on account of the mosquitoes: some betook themselves to the grass of the savannah; some to the trees among which they slung their hammocks, high up out of

reach of these pests ; others, among whom was myself, slept on a sandbank by the riverside.*

I stopped six weeks with these Indians, who treated me with the greatest kindness. They lived on game, of which there was an abundance, fish, which they killed with bow and arrows, and maize, cassava and plantains.†

* It might be interesting in this connection to recall Humboldt's experiences of the mosquitoes in these Orinoco districts, but due east of the Meta. At San Borja, for instance, he states that it was not possible to speak or uncover the face without getting the mouth and nose filled with these insects ; while, at Guaripo, he and his companion slept on the beach, there being fewer insects in the strata of air lying immediately on the river than near the edge of the forests. He tells how the missionary Bernardo Zea, to escape these plagues, had built for himself near his church, on a scaffolding of trunks of palm-trees, a small apartment, in which he (Humboldt) was enabled to breathe more freely, and to which he and his companion went up in the evening to dry their plants and write their journal ; while, at Maypures, the Indians quitted the village at night to go and sleep on the little islets in the midst of the cataracts, where they were able to enjoy some rest. Perhaps the most peculiar method adopted to avoid these insects, is that narrated of the inhabitants between the little harbour of Higuerote and the mouth of the Rio Unare, who were accustomed to stretch themselves on the ground and pass the night buried in the sand three or four inches deep, leaving out the head only, which they covered with a handkerchief.—ED.

† If this section of the Guahivos (*Guajibos, Guahibos or Guagivos*, a the word is sometimes written) is representative of the tribe at the present day, they present a considerable advance since the time of Humboldt, in their cultivation of maize, cassava and plantains. Humboldt says of the Guahivos, that no tribe is more difficult to fix to the soil, that they would rather feed on stale fish, centipedes, and worms, than cultivate a little spot of ground ; and that other Indians say of them that " a Guahivo eats everything that exists, both on and under the ground." Possibly, however, this referred to them only in their connection with the mission stations, the restraints of which were irksome to them, accustomed as they were to be perpetually moving from place to place *(Indios andantes)*.—ED.

Besides these they ate several fruits which they procured from the forest, and among these I noticed the seed of a palm, known in British Guiana under the name of Durabana, from which "bush chocolate" is made. Their clothes were made of the inner bark of a tree, very tough and very close in texture: they called it *taka-taka*. The men wore a small lap of this material; but the women made use of a piece about four feet square, which they drew across the body under one arm, and then fastened over the other shoulder, thus giving themselves the appearance of being clothed in a sack, which had been cut open along the bottom and one side. Men and women were all more or less painted in red and blue, especially about the face, chest and arms. They are a rather short race, but very sturdily built, the muscles of their arms being very finely developed.* They are of a more decided red colour than any other tribe I have seen. They are exceedingly good shots with the bow and arrow, and are very skilful in killing the turtle which they shoot in the following manner. When a turtle is seen floating on the surface of the water, they shoot an arrow high into the air; and this arrow, falling with great power and velocity, pierces the shell of the animal. These arrows are fitted with a loose head, triangular in shape, very heavy, and made of some

* This description differs considerably from what Humboldt relates of the Guahivos, though possibly, in each case, the description may apply to different sections of the tribe, or possibly to the same section under different conditions. Humboldt relates of those with whom he came in contact at the new mission of San Borja, that their shape was in general slender; that several of them had beards of which they seemed proud; that their bodies were not painted; and that the faces of all the young girls were marked with round black spots.—ED.

extremely hard wood. This head is attached to the shaft by a long piece of twine, which is wound several times round it; and, as the turtle dives, the shaft becomes detached, and floating on the surface of the water, informs the hunters of the movements of their prey. Their skill in this mode of shooting is really surprising. Except those who had been to San Martin, none had seen fire-arms; and they marvelled greatly over the hole that a bullet from my revolver had made in the stem of a tree, and were even more amazed when I brought down a couple of muscovy ducks, right and left, with my breech-loader.

The men wore pieces of reed, about four inches long, passed through the ears, nose and lower lip, giving them a very grotesque appearance. During my stay, two Indians arrived from another tribe whose dwellings were on the Gaviare. These men spoke a different language, and only one of the Guahivos was able to converse with them; they were also of a darker colour, but armed and painted in the same manner. They were on a journey to Brazil for the purpose of obtaining *Curare poison* (evidently that known as Wourali in other parts, and made by the Macusi Indians who live on the borders of Brazil) and the twine from which they make their hammocks.

The Guahivo women were frequently engaged in spinning wild cotton; but all the hammocks were made of this twine procured from Brazil, which is a a kind of Tibiserie, but much finer, darker in colour and better made than any I have seen in Demerara. These people are evidently a race of hunters and probably a warlike race, as they seemed to have no industries. At

the same time, they appear to be a temperate race, as during my visit they did not have any drunken feast, which they would surely have done on such a (to them) great occasion, if such orgies were at all in vogue.* Neither did any of them ask me for *aguadiente*, with which those who had been to San Martin, must certainly have been acquainted. Their language had rather a pleasing sound when spoken by the women, but when spoken by the men it was harsh and guttural. Among the curios I secured as mementos of this visit was the head-dress worn by the chief. It was a fillet composed of the orange and red feathers of the toucan, but differed from all other feather ornaments that I have seen, in that it had no stiffening of bamboo and is worn with the feathers in their natural position, falling one over the other, not standing erect, and having thus a very smooth and pleasing appearance.

I also obtained from them a curious powder, which is taken like snuff and which has the effect of making them drunk. It produces besides the effect of opium, as they were evidently in a happy state while under its influence. This substance which seems to be prepared from a gum,

* As to the temperate habits of the Guahivos, Humboldt remarks concerning those Indians at San Borja, that they were offered brandy in vain and they would not even taste it ; while on other occasions, he had frequently been unable to persuade Guahivos to partake of strong drink, even when they had been engaged in hard work and were consequently tired. In his time they were certainly a warlike race, for they were the terror of the traders along the course of the Meta, many of whom were killed at different times by the poisoned arrows of the Indians. They also frequently carried off great numbers of cattle from neighbouring farms; and, even at the time of Humboldt's visit, threatened to burn down the missionary village of Carichana.—Ed.

is called *Yopa*, and is very volatile, its virtues being lost in a few months. This *Yopa* (in Spanish spelt *Llopa*), is probably known in other parts as I have heard the word *Enllopado* used by the New Grenadians as signifying *drunk*, while in its original sense it would mean *under the influence of Yopa*. Thus if this derivation be correct this substance and its effects must have been at some time known to the Spaniards.*

They chew the wood of a curious liana, which has the same effect as the leaves of *Erythroxylon coca:* they can travel great distances existing only on the wood of this plant, and not feel the want of any other sustenance.

I am inclined to think that at one time the Jesuits must have had a settlement in this direction, for I understood from the signs of the Indians that a day's journey down stream there was a house built of some hard material,

* It is interesting in this connection to recall the fact that a similar habit of snuff-taking has been described among other tribes in the same or neighbouring districts. Thus of the Ottomacs, who, like the Guahivos, are wandering Indians *(Indios andantes)* of the savannahs, very difficult to civilise, having a decided aversion to cultivating the land, and who live almost exclusively by hunting and fishing, Humboldt relates that they throw themselves into a peculiar state of intoxication, almost of madness, by the use of a snuff, or powder, of *niopo*. The snuff in this case, however, is prepared from the pods of a mimosacea, mixed with cassava flour, and lime from snail-shells, the whole being baked into small cakes, which are ground into powder before being used. The *niopo* is so stimulating that the smallest portions of it produce violent sneezing in those who are not accustomed to its use—a stimulating power apparently due to the freshly calcined lime. The *niopo* is taken by the Ottomacs in a peculiar manner. A forked bone is fitted to the nostrils, and through this the powder is inhaled. It is believed by them that the *niopo* cannot be tak en in any otherway. I have ascertained from Mr. Wallace that the Guahivos take their *yopa* in a similar manner.—Ed.

and also a square plot enclosed by a wall of the same substance. This supposition seems almost certain when taken in conjunction with the fact that the place, though not mentioned to my knowledge in any map, is known to the dwellers in San Martin by the name of *"San Vicenti"*, a name clearly indicating its origin; moreover the Indians themselves call it by a similarly sounding title.

Nothing happened to mar the peacefulness of my visit, and we parted with many expressions, or rather signs, of friendship. I gave them all the little things I could spare, and they loaded me with arrows, hammocks and other curiosities until my mule and myself looked somewhat like a travelling caravan. The chief sadly wanted my coat, but this was more than I cared to part with. KINGSLEY mentions the Guahivos in *"Westward Ho!"* as belonging to the earth-eating tribes, but I saw nothing during my visit that would corroborate his statement.*

* Probably in such a work, Kingsley used the term Guahivos to include not only the most important tribe of the wandering savannah Indians, but also the other closely allied tribes *(Indios andantes)*. The term would thus include the rude tribe of the Ottomacs, already referred to, who, during several months of the year, as related by Humboldt, swallow considerable quantities of clayey earth. Humboldt implies that the Guahivos proper were not addicted to this habit, for he relates the case of a Guahivo girl, who, by earth-eating had been reduced to a lamentable condition of atrophy, as an instance of the effect of the habit on tribes not accustomed to it.—Ed.

*Notes on Steam Boilers applicable to Sugar Estates.**

By W. Price Abell.

THE high price of coal, and the proportionately great boiler power required on a sugar estate, led me to expect that the condition and efficiency of Boilers in Demerara would at least compare favourably with the present English practice, but in this respect I was somewhat disappointed. Possibly my standard of efficiency is high from the fact of my practical acquaintance with the shops of two of the world's greatest engineers in Lancashire, a county which contains according to the best authority, more steam-power than America; and you will no doubt agree with me that to this county we should look for the lead in all matters appertaining to steam machinery, from the compiling of a specification of construction to the investigation of an explosion. The absence of a satisfactory system of boiler insurance and inspections, is rather startling to a stranger arriving in this colony which is so dependent upon the efficiency of its boilers: of course there is boiler inspection after a manner; but my professional friends know that this to be done efficiently, necessitates trying and attentive work on their part, and even then, unless there has been a special training, and almost exclusive devotion to this work, the results are anything but satisfactory. There is no doubt but that periodical inspection by competent parties is the best means of

* Read at the August meeting of the Society.

preventing explosions; and not only is this the best guarantee of safety, but also a great source of economy, through the detection of slight flaws, which, if allowed to continue, develop into serious defects, requiring expensive repairs, besides causing serious corrosion to other parts through leakages. There can be no doubt that a great number of accidents are strictly preventible, while others are nothing of the kind; and it is to the former that we must direct our attention, since no amount of examination could detect hidden or buried flaws. A steam boiler can be made when new to resist a given pressure say 100lbs. on the square inch, and its power of doing mischief is so far limited. When that boiler is at work, there are so many thousand foot tons of energy locked up in it, which, if the shell plates or flues give way, will be let loose in a moment to do fearful damage. The strength of the boiler plates is the agency by which we control the force of the steam. If the plates are allowed to become too weak by corrosion, there is an explosion, but this explosion is seldom an accident, but the result of negligence, ignorance or parsimony. One of the first to take up the matter of boiler explosions, and seriously consider them, was the late Sir WILLIAM FAIRBAIRN, who in 1854, founded the "Manchester Steam Users Association," for the prevention of steam boiler explosions, and for increasing the efficient working of steam engines; and since then much good work has been done. However, much remains for us Mechanical Engineers to accomplish, especially when we remember that in our most efficient arrangements for obtaining work out of coal, over 80 per cent. of the heat is wasted.

A Steam Boiler is simply a thing to absorb heat.

The bottom line of this science is the bottom line of an old pot over a fire, which is the best heating surface in the world; there is water upon one side of the piece of metal, and heat on the other: one square foot of metal will transmit through it a given number of units of heat into the water, at a given temperature, in a given time; 2 square feet twice as many, and 3 square feet three times as many, and so on: put a cover on the pot and seal it tight, leave an orifice for the steam, and that is the steam boiler with all its working mysteries. The points to be considered in the selection of a new boiler are type, design, materials, workmanship, safety, efficiency, and economy.

Type. The particular circumstances, and requirements of the steam user, should always be carefully considered before deciding as to what type of boiler ought to be adopted. In large towns where space is a matter of importance, boilers of the multitubular class, such as locomotive, marine &c., will be found very suitable, and as a cheap supply of pure feed water can now be obtained in most towns, and also a good furnace draught from the necessary tall chimneys, the principal objections to the use of these boilers has been removed. Some few years back I remember seeing some boilers of this type that had been working with scaling water in a sugar estate in Australia, the furnace crown stays were simply matted, or scaled together with limestone most beautifully stratified, as may be seen from a scarf-pin I am wearing, which is far more useful, and ornamental, to me, than it ever was to the boiler. The freeness of water in Demerara from carbonate of lime, chalk, gypsum and other incrusting solutions, coupled with the great

amount of megass and wood used as fuel in efficient furnaces, tends to render the plain multitubular boiler very efficient here, and this considered with its low first cost, renders it perhaps more than others the boiler for a sugar estate, although in England, from the conditions of the water and fuel there, it is almost a curiosity. On arriving here, I found much uncertainty respecting the necessity of *Horizontal Steam Chests* for both multitubular and compound boilers; from what I have seen of multitubular boilers here the necessity of a horizontal steam chest arises from their being insufficient steam space in the boiler, thus leading to wasteful and dangerous priming.

It is a fact that a boiler with tubes not higher than its centre line will give more satisfaction than one with high tubes having a horizontal steam chest. It is evident that if an upward current exists in the medium through which the foreign particles are sinking they will move with a velocity which will be the difference between the velocity of the current of their downward tendency. If the upward current is more rapid than the rate of falling, the particles must be carried upward, and will be so carried as long as the velocity of the current is maintained. Now in the steam boilers the proportion which the free water surface bears to the power of the boiler varies very greatly, and the velocity with which the steam rises from the surface is not only inversely as the area of the free surface, but also inversely as the pressure; while the viscosity is unaffected by the pressure.

Now bearing in mind that a drop of water $\frac{1}{1000}$ inch diameter falls at the rate of 0.067 per second, it is easy

to calculate that the tendency to carry up water, or to prime, in multitubular boilers with high tubes, is twice as great as we find in the Lancashire or Cornish boilers; it follows from the theory of evaporation, and viscosity which I have just laid before you, that small steam domes cannot be of any use to check ordinary priming. The area of a vertical steam dome, or of a strainer is necessarily many times smaller than the area of the free water surface, hence the velocity of steam passing through them must be very much greater than that of the steam rising from the water; and if in the latter situation it is competent to carry up particles, it is plain that they cannot be precipitated in the steam dome, where the velocity is higher. This fact has been found out by experience; for steam domes are seldom applied now to any kind of boiler, though in the case of crowded heating surfaces, and small steam spaces, both steam domes, and strainers may be found useful to obviate the coarser kind of priming. A very successful way of separating water carried along by steam, is to cause the latter to impinge against a plate interposed at right angles to its course; the particles of water dashed against the plate adhere to it, and trickling down drop off at the lower edge in particles too coarse to be again carried up by the steam. The water so collected is returned to the water space of the boiler (see Fig. 1). A perforated plate placed about half the depth of the condensed water collector is perhaps advisable with fine priming: also an efficient separation is shown in (Fig. 2). Priming depends not only on the form of the boiler, and the steam pressure, but also on the quality, and condition of the water. I think the sketches (Figs. 3 & 4) will show

FIG. 1.

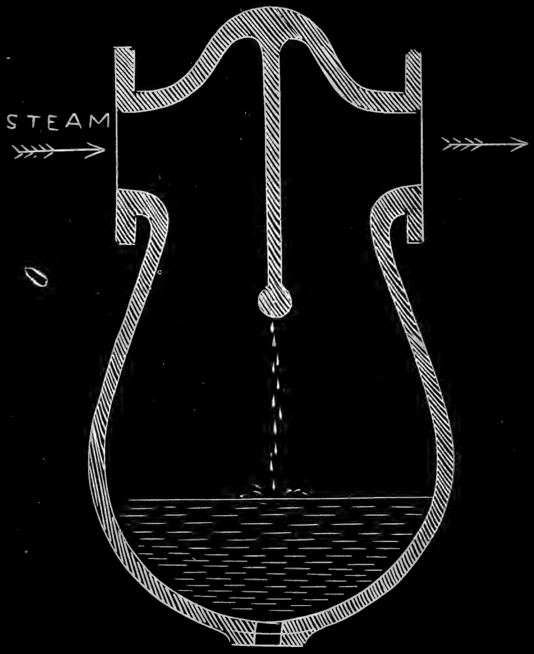


FIG. 2.

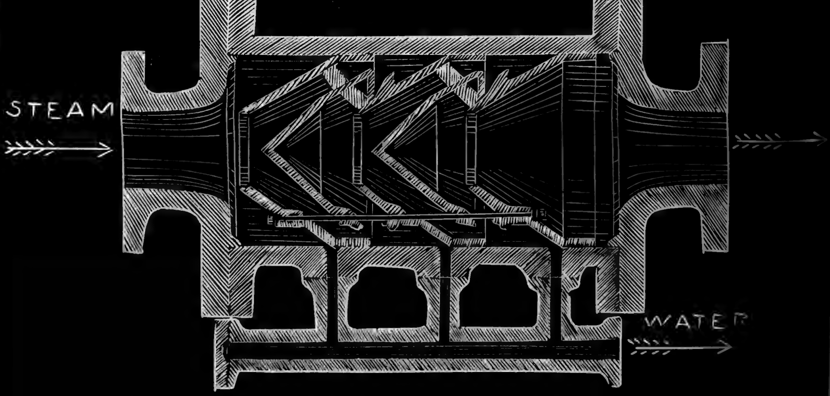


FIG. 3.

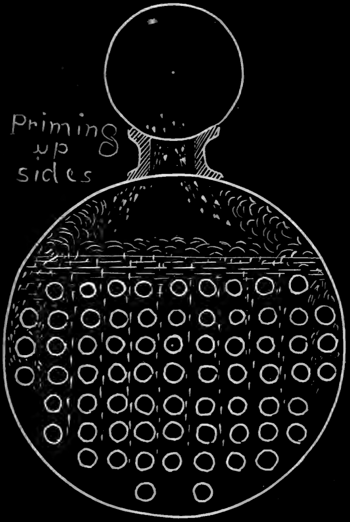


FIG. 4.

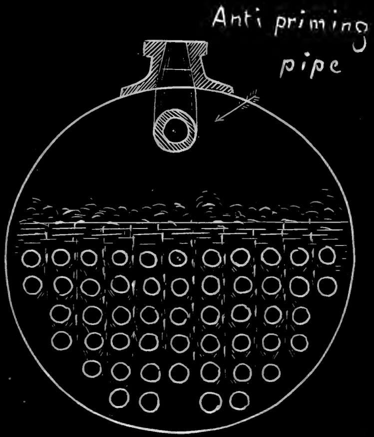


FIG. 5.

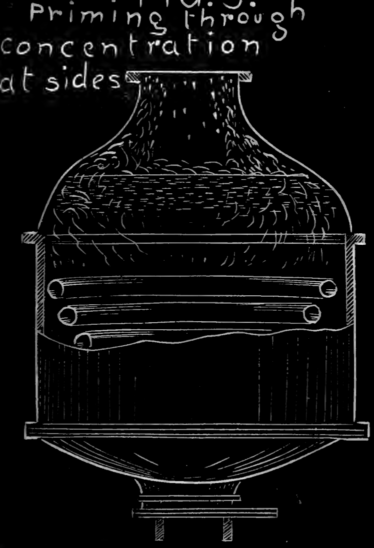
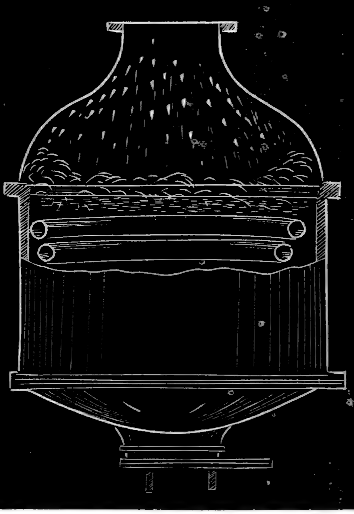


FIG. 6.



more clearly how the concentrated steam generated on high tubes throws up the water thus causing the wasteful priming.

In passing, one connected with sugar manufacture cannot help but see the advisability of boiling vacuum pans as seldom as possible with the liquor in the top part, and thus avoid the priming which is not at all uncommon in some pans. Figures 5 and 6, illustrate this as seen through the sight glass. The vacuum pan with its sight glasses is most instructive in the cause of priming; in it the velocity is very high, on account of the immense specific volume of the steam at 13 lbs. vacuum. The boiling is consequently very violent, and the priming is so great, that savealls are necessary equipment of pans—indeed, no longer since than last week, my attention was drawn to a saveall that was completely filled with small grain sugar, accumulated by the high velocity of the steam which is about 2½ feet per second. It is the excessive priming that causes so much wasted sweets in the condensed water from the vacuum pumps, and I believe few of us attach sufficient importance to it. It is from the foregoing reasons also that we require more attention to be given to the circulation of the liquor, and separation of the steam from the liquor in Triple Effets, where the depth of dense priming often exceeds 6 feet.

I think I cannot do better than give you Mr. LAVINGTON E. FLETCHER'S opinion on priming in these boilers, as expressed to me in a letter last month. "No doubt the fact that the water with which your boilers are fed, is slimy and contains vegetable matter, has much to do with the priming; and the harder you fire the boilers the

more they will prime. Although we are not advocates of putting grease in the boilers, in your case no doubt a little grease would tend to reduce the priming. You allude to the scantiness of your steam space above the tubes. No doubt the more steam space, the less priming. Were your boilers 7ft. or 7ft. 6 inches diameter instead of 6ft. 6 inches as at present, with the same amount of work to do, they would work more easily, and prime less. The large horizontal steam trunk you show, I should think a good arrangement for the prevention of priming.

Our practice is to adopt anti-priming pipes: we generally make their length equal to the diameter of the boiler, but the longer they are the better. The aggregate area of the perforations should only slightly exceed the thoroughfare through the stop valve; I doubt if they would do better than the steam trunk with your slimy water."

With a chimney draught, the ratio of the diameter of the tubes to their length should not exceed 1.28, otherwise the draught is not sufficient to keep them clean of soot, a very common fault with the long boilers in use here. It is very desirable to have a standard size and thus reduce the stock of tubes now obliged to be kept in the colony, and $4\frac{1}{4}$ internal diameter is perhaps as large as economy admits: this of course gives us a boiler 10 feet long.

The long boilers most extensively adopted in England, however, are those known as the "Lancashire," and "Cornish," and although objections to their use, on many grounds, have been raised from time to time, their popularity has in no way abated. They have fulfilled hitherto the general requirements of steam users; they are

more easily cleaned, and repaired than almost any other kind, and although like all other good things, they can only have their day, the improved boiler that may ultimately take their place, does not appear to be so far developed as to make steam users hesitate in adopting the "Lancashire" or "Cornish", and feeling confident as to these giving the best general results for a long time to come. *A Compound boiler* is simply a short Lancashire and multitubular connected together, and is, perhaps with clean water and good draught the most economical for fuel, being simply a cheap way of carrying out the principle of the marine boiler, whose economy is most perfect. In it we have the internal grate, and fire box, which is the most efficient kind of heating surface, then the combustion chamber, in front of tubes. Mr. WILSON very clearly points this out in his instructive work on boilers; unfortunately there are many practical objections to their working that have placed them somewhat out of fashion in this colony, not the least of which is their inaccessibility for repairs.

Design. After deciding as to the type of boiler, and power required; the steam user should be careful to ascertain that each part of the structure will be proportionate. Many boilers, both new and old, are found to be very deficient in this respect, certain parts having an ultimate strength equal to eight or ten times that of the working pressure, whilst others have only factors of safety of two, or three, which reminds one of the two parts of the ten-ton chain, united by a three-ton link. As all the parts of a boiler are of importance, full details should be provided for the guidance of the boiler-maker. There are certainly many competent firms who make a

practice of turning out only the best work ; yet they as a rule prefer to be supplied with complete specifications, as otherwise it is not difficult for makers less capable, or less scrupulous, when competing, to underquote them by using plates of lower quality, or by adopting a cheaper form of construction generally. And it is only after the boiler has been set to work that the insignificance of first cost cheapness is felt, as compared with good material and sound work.

Material.—The quality of the material to be used in the construction of a boiler is a matter of great importance, depending on various conditions ; for instance some twelve months since I put two strips of metal, one iron, and the other steel, into two boilers, identical in every respect except the kind of feed water, one using exclusively fresh bush water, and the other feeding with old bush water sometimes mixed with river water. On taking the strips out a short time since, I found the fresh bush water had corroded, or eaten the iron strip about 25 o/o more than the steel; and that in the other case the iron and steel decay was virtually equal; I have seen cases in England where the freeness from corrosion was in favour of iron. Of corrosion I shall have more to say in a future paper. When iron is decided upon, care should be taken to specify it of those brands only which are known to be of thoroughly good repute. Doubtless steel is the material of the future ; the special experience of boiler-makers in the working of steel, is now very considerable, and the appliances for its manipulation are well calculated to minimise straining during construction. By the use of steel the weight of a boiler is reduced from 10 to 15 per cent., and the price of steel boilers is a mere

trifle, if any thing, in excess of those built in iron. For the furnace it has the advantage over iron, of not being so liable to laminate, and blister; when adopted for the shell it is essential that it should be of mild ductile quality. It is of more importance that boiler plates should be ductile, than that they should possess a high tensile strength. The thinner steel plates admissible in construction for the same strength of boiler, materially increases its efficiency by very considerably facilitating the conveyance of heat to the water. This opportunity may be taken of pointing out that, owing to the very special treatment required for the manipulation of steel plates, they are totally unfit for repair jobs in the hands of the inexperienced boiler-makers not connected with steel boiler shops.

Wrought-iron plates, somewhat thinner than the old original plates, are the best for repairs. However much depends on the selection of a boiler, more depends on the seating; the old fashioned plain cylindrical boiler, is simply a plain round pot placed over a fire, and if this is seated efficiently, it will be found capable of making steam as cheaply as the more recent types; and considering that it is the seatings that are mainly responsible for a boiler being considered old after 13 years work in this colony, whilst in England the same stage of decay is not reached before 26 years of work has been done, I hope you will tolerate some remarks from me in a future paper on this subject.

Occasional Notes.

The Third Ascent of Roraima.—This ascent of the mountain was made by Mr. F. DRESSEL, who, a few months ago, journeyed to that district to collect orchids—and of these chiefly the beautiful and recently described *Cattleya Lawrenceana*—for Mr. SANDER, the great orchid dealer in St. ALBANS. Curiously enough the second ascent of Roraima, in November 1886, was made by another orchid collector, Mr. CROMER, connected with the same English firm. As was to be expected, both of these gentlemen ascended the mountain by the path on the south-western side discovered by Mr. IM THURN and Mr. PERKINS, in their memorable first ascent in December 1884.

During the time of Mr. DRESSEL'S visit, the weather was singularly dry, scarcely any rain falling, and that of a light character and of little duration. The appearances of the scene, noticed by Mr. DRESSEL, were therefore just such as would be expected under such conditions from the knowledge which we have of the mountain through the first explorers, who it will be remembered arrived at Roraima towards the end of a dry season, and were not able to make the ascent until one fine and fairly clear day broke after three days of heavy and almost incessant rain and thunder. After such a down-pour, it will be remembered, Roraima presented the appearance of a saturated or super-saturated area, the upper surface so to speak, reeking with moisture. Mr. DRESSEL, who ascended on the 14th October after continuous dry weather, found the upper surface comparatively dry, the

elevated portions most markedly so; while large areas of the sward-like levels were perfectly desiccated. The water in the various channels was very shallow, and the deep basins or depressions contained but very small quantities, though in no case was any found to be quite dry. Frequently the surface of the water in these shallow basins was more or less covered with a green, apparently a confervoid, layer. In these pools at the bottom of these wide basins, Mr. DRESSEL found a considerable quantity of quartz, in the form both of separate crystals, and of aggregated masses, of various and often of large sizes. The presence of such quartz in such positions and under such conditions, is an extremely interesting fact, though our want of knowledge of the petrographic character of the formation on the top of Roraima beyond the fact of its being sandstone, renders it barren and one hardly justifying speculation.

It will be remembered that on the first ascent, no animal life was noticed during the short time spent on the top; and this necessarily denoted the likelihood of the absence or great rarity of birds and insects, which are, so to speak, the only two obtrusive forms of animal life. During the two or three hours, spent on the top by Mr. DRESSEL, no birds were seen; but a few specimens of butterflies, all of one kind, and of a dark-brown and nearly black colour, were observed, and two of them caught, though, unfortunately, owing to the difficulty of keeping them until arrival in town, one alone was sufficiently preserved to shew much of its structure. In the shallow basins a few forms of a small black toad with a yellow spot on the throat, were also seen, and one was caught; but, being left in a

meat-tin at some place intended to be repassed, it was accidentally left on the top. Doubtless this tin will be found by the next traveller who ascends, and will tell its story in a somewhat similar manner to that in which a medicine bottle left on the top by Mr. CROMER, did to Mr. DRESSEL. This bottle was found by him, or rather was pointed out to him by the Indians who ascended with him, one of whom, the so-called "doctor" at Teroota, declared that he had ascended both with Mr. IM THURN and with Mr. CROMER. The medicine bottle, however, gave more explicit information, than the meat-tin can possibly give under the circumstances; for inside was a piece of paper bearing Mr. CROMER'S name, and stating that he had ascended the mountain on the 3rd November, 1886, under most difficult and dangerous circumstances. To this Mr DRESSEL added his name with the date of his ascent. The meat-tin, on the contrary, when found, might not even contain the bones of the small toad.

A third animal form was found in the moist earth attached to some plants which had been pulled up, a "forty-legs," as it was termed by Mr. DRESSEL, though from his description it is certainly not a centipede, but a millipede, allied to the *Julus*, the little dark and close-ringed worm, with very numerous and close legs, found commonly curled up in a ball under stones etc., in moist, situations. This specimen gradually separated into its constituent rings—as happens with all such forms unless they be well taken care of—and was, unfortunately, eventually thrown away as useless. With such forms as the above, inhabiting the land, the water and the air, it is not too much to expect that, at some not very

distant day, it will be possible, when a strictly zoological search has been made, to describe an interesting and by no means limited fauna from the top of Roraima.

As to the feasibility of spending a night or two on top, Mr. DRESSEL thinks that, if about three travellers were together, so as to be independent of the Indians during the night as to whether they remained or descended, it would be fairly practicable to do it, in such a correspondingly dry season, for there are very spacious excavations and cave-like parts in the large and overhanging rocks, which are perfectly dry and would afford all the shelter required ; while with the help of the Indians, the food required, and a few blankets and waterproofs for greater safety, could be easily carried up. The mountain, in the dry weather during his visit, was never really quite hidden for any long periods of the day, though clouds of greater or less extent were often hanging and passing over various parts of it; so that, though constant recurring mists in the rainy season might militate against one fine and clear day for ascent being followed by another for descent, yet in the really dry season, it would be highly unlikely that such a preventative should exist for any length of time.

The fantastic shapes into which the sandstone has been formed, and the weirdness of the scene, which have been so graphically described by Mr. IM THURN, affected Mr. DRESSEL in a similar manner. He mentions that the surface of the rocks presents very closely the appearance of granite, owing to weathering, and at first he thought some mistake had been made in describing the formation as sandstone, until he moved away a small rock from its setting when its real nature was revealed.

The very curious configuration of the top of Roraima as described, and which is evidently due, as Mr. IM THURN points out, to extraordinarily active aerial denudation, is not difficult of explanation with regard to the variety of conformation. The effect of marked alternation, though possibly for variable periods, of the dry and rainy seasons, on such an exposed and unsheltered area, and on such a yielding substance as sandstone, presents circumstances sufficient for the explanation—though real confirmation could only be obtained by observations on the spot extending over a considerable period of time. The effect of continued dry weather on the surface, with the resulting cracks or fissures, but opens out the road, so to speak, for the march of the effect of the rainy season. The prevailing direction of the winds and rains, on an unsheltered surface, gradually affects most the surfaces opposed; while other surfaces are modified, in the long run, by changes in the direction of these aerial forces. Abounding channels are formed in the sun-cracks, pillars are left standing and basins hollowed out; and these, according to the shapes and directions of these cracks or fissures, and the opposed forces of wind and rain at varying periods on the hardened upper surface and the softer revealed surface, work out the various marvellous shapes present—the most marked effect being noticed where an unequal play results from the greater constancy in any one direction of the denuding forces. Such a formation, resulting from such denuding forces on the top, fully bears out the comparison made with what, Mr. IM THURN tells us, are called *Eppellings* by the Indians; but the conformation of the mountain group itself and its neighbouring parts,

points certainly to some more deeply-seated and powerful denuding factor, such as that surmised by Mr. BARRINGTON BROWN, than simply to the forces of aerial denudation.

Mr. DRESSEL gives a very entrancing picture of the views obtained from Roraima, of the underlying parts. At the time of his descent, the clouds were apparently drifting towards, or were hanging by, the mountain in the South-west; so that while the view horizontally was hidden by a veil of white, the underlying country was lighted by sunshine, with striking contrasts of hill, and vale or plain—the former gloriously gilded by the sheen which touched it and crowned it, and the latter bathed in a thin film of darkness, deepening as the day declined, and as the shadows gradually stole across the hills. But after all, this can alone be fully and fitly portrayed by the pen of one who has gazed upon the scene.

In Mr. DRESSEL'S experience, the descent was one of very great difficulty, since he found himself frequently landed at the bottom of various pits or hollows from which it was often difficult to extricate himself or to be extricated. At the same time, he regards the difficulty of ascent and descent of Roraima as little compared with that of the Merumé mountains, over which he had to climb to and from the Mazaruni—an opinion that calls to mind Mr. BARRINGTON BROWN'S experiences in those mountains in his trip while surveying the colony. To increase the difficulty and danger of this descent of Roraima, Mr. DRESSEL states that it got dark before they had passed through the forest belt; his progress was therefore more a succession of falls than the stately march of the man who had made the third ascent of the famous mountain. As

a result of his various slips and falls, he was considerably bruised and battered at the finish; and, in his own graphic style, he states that "he thanked his God when he found himself again in his house on the slope".

Inoculation against Snake-bite.—Recently this subject has claimed more or less attention in the colony, while, to judge by report, it occupies, or has occupied, quite a foremost place in the neighbouring colony of Surinam. That a large number of people may be inoculated or "cut" against snake-bite, and that these may entertain a lurking or definite belief in the efficacy of the process, may certainly be true; and more than this, it may also certainly be the case that persons, so "cut", catch and handle snakes with impunity, and even in cases have been bitten by various snakes without any deleterious result; yet, in admitting all this, nothing whatever in support of the efficacy of inoculation against snake-bite, is necessarily admitted. From the constitution of ordinary human nature, it is not difficult to understand that many persons who may at any time be exposed to the chance of snake-bite, may not only be willing, but desirous to protect themselves and their children by an inoculation pronounced efficacious against snake-poison, when the harmlessness of the substance otherwise is evidenced by the fact that others have been so operated upon without harmful result. But, it is scarcely necessary to remark, this prevalence of the habit is no proof whatever of the efficacy of the inoculation. Nor is the fact any more weighty that persons inoculated have been seen to handle various snakes, perhaps even undoubted poisonous snakes, when it is borne in mind that snakes as

a rule, and markedly the most poisonous snakes, seem singularly reluctant to bite, owing perhaps more particularly to their sluggishness—a fact borne out by those who have seen, or have had much practical dealings with poisonous snakes, and in whom the commonly prevailing horror of these animals is almost or quite unknown. A typical case, familiar to most colonists, may be mentioned in CHARLES WATERTON, who it will be remembered, without hesitation, transferred several specimens of rattlesnake from one box to another, by placing his naked hand into the box and taking out one specimen after another. Other cases, perhaps more widely known and wonderful, may be adduced in the so-called "snake-charmers" of India, who are accustomed to handle with almost constant impunity, and even to excite to a marvellous extent, the cobras of India—snakes, which, for their size, are the most deadly known. In fact, the account of the snake-charmers' exhibition, under Dr. WALL, before the Prince of Wales, reads more like a magician's tale, than like the record of the fearlessness of men handling and exciting animals, each one of which was capable of inflicting sudden death on a large number of the people present—and one of these snakes taken at random at the Prince's request, who had expressed a doubt as to their being in poisoning condition, was made to discharge some of its poison in proof of its condition.

In place of the vague and unsatisfactory statements offered as to the efficacy of inoculation, before credence can be given, it must be established beyond doubt that persons so inoculated are bitten with impunity by undoubted poisonous snakes in functional condition, and

bitten in an undoubtedly effectual manner, before an experimental committee, or, at least, before some one of undoubted faith who at the same time is familiar with the characters of snakes and the general action of snake-poison, so that the necessary conditions of exact inquiry may be fulfilled.

That astonishing exhibitions of the immunity of the inoculated have been witnessed by individuals, who however educated generally, are really quite unfamiliar with snakes, amounts to nothing. To such individuals the very terms used in separating the poisonous snakes, such as "flat-headed," "fangs" etc., are, as I know, points of confusion, owing to their ignorance of any type which may be used as a basis of comparison for the comprehension and accurate application of such terms. To a very large number of people, the very word *snake* is almost synonymous with *poison*; and, unless they are told to the contrary, each kind of snake is to them presumably a poisonous snake, especially if it be large. To such, some of the most harmless and simple exhibitions, especially as regards bites from snakes, would easily appear remarkable. Besides this, the coloration and markings of poisonous and harmless snakes often considerably resemble each other; and from this cause ordinary trifling with harmless snakes is liable to be looked upon as remarkable by such people, especially if the inoculated operator be equally ignorant or be influenced by fraud. The presence of the special kind of nerve for handling snakes, even harmless ones, would by such be ascribed to the effect of inoculation, if the person be inoculated, whereas it may be purely a matter of temperament—though the belief in one's immunity

might certainly lend nerve of the kind. And if the snake be handled, without its attempting to bite, inoculation receives the credit of protective power, even though any other person with corresponding nerve, might equally have handled the reptile; while if the snake does bite, and, being harmless, produces no result, inoculation also receives the credit. On these considerations, it must be yielded that, however remarkable the performances with snakes in the hands of the inoculated may be to an observer, they are worse than worthless, unless the observer is really familiar with the structure, and the characteristics and habits of snakes—a fact that should be proved in every case, however eminent the individual may be in other respects. At present no such competent observer has declared himself, either as a believer in inoculation, or even as one who had witnessed any seemingly remarkable phenomena in connection therewith.

As an example of the erroneous impressions that may be conveyed in perfect good faith, I may adduce exhibitions with green snakes, since I have had such snakes named to me in such a connection, and since I have been able to benefit by common ideas regarding one, a harmless whip-snake *(Dryiophis fulgida),* which has been exhibited for some time in the Museum. Several different kinds of green, or nearly green, snakes are to be found in the colony, one of which is a poisonous Viperine snake, known it appears commonly by the term *parrot* snake, though it may well be doubted from the general use of this name for the harmless green snake in the Museum, whether this term is not commonly applied to all of them generally. An exhibition may be seen with

a really harmless, but a thick and large, green snake; the loose term "parrot snake" may be given to it; the snake may even bite the inoculated operator, of course with impunity; and the onlooker may with all good faith, but with all perfect ignorance, stake his belief in the efficacy of inoculation—for has he not seen with his own eyes, that a *parrot* snake was not only handled by the inoculated, but that its bite was rendered innocuous! This is no overdrawn example; it is based on sober fact! And though it assumes a want of knowledge in the observer, it is no far-fetched assumption, since it is necessarily a general condition; and unless an individual selects snakes somewhat as a subject of study, for which the generality of people have neither the inclination nor the conveniences for practical application, he must of necessity be ignorant on the matter. Rather than knowledge, it is an unreasoning dislike or dread of snakes, which seems to characterise people generally, and this feeling is often present even where there is knowledge. To any one who by experience has become familiar with the loose and ignorant application of such names of poisonous snakes as *bushmaster, labarria,* etc., to such snakes as the different species of camoodies—snakes quite harmless as regards poisoning power—there is no difficulty in accounting for the commonly prevailing idea of the efficacy of inoculation against snake-bite.

So much for the general circumstances of the case: it may be as well now to glance at the special features involved. Attempts have been made to compare the inoculation against snake-bite with inoculation against small-pox or the virus of rabies etc.; and to argue that immunity from disease in the latter cases lends credence

to the idea of immunity in the former case. In the present state of our knowledge, however, as to the constitution and action of snake-poison, and the nature and action of the virus of small-pox and rabies, no such comparison is warrantable. For while in the latter cases, immunity from direful disease is caused by the introduction into the system of what practically amounts to a mild and harmless form of the same thing in order to make the system sterile or barren against the attack of the virulent form, nothing comparable takes place in inoculation against snake-bite. Inoculation with mild doses or small quantities of snake-poison which may be insufficient to kill, do not protect against the dread action of a larger quantity. Moreover, the effect of an injection of an appreciable quantity of snake-poison into the system, is rapid and almost immediate, death resulting within a few minutes or at most a few hours, the slightly variable time being dependent upon the amount of the poison, the degree of virulence of the snake, and other appreciable conditions. There is here in the characteristic action of snake-poison no prolonged time of incubation, as in the characteristic action of the virus of the zymotic diseases. And though in one species of Indian Colubrine snake *(Bungarus fasciatus)*, a prolonged period of some days is sometimes known to occur before death, apparently dependent on the size and vigour of the snake, and thus upon the amount of poison injected, an incubatory period is negatived by the fact that the normal action of the poison of this snake is as rapid and immediate as in other poisonous snakes generally, where the action is comparable in its effects rather to such a definite poison as strychnine than to a "ferment."

More than this, the essential constitution of snake-poison is utterly different from a "ferment." Its analysis yields nothing comparable to an infecting organism, and in fact solutions of snake-poison have been submitted to thermal conditions which preclude the existence of an infecting organism, and yet these solutions produced the characteristic effect of normal poison in its characteristically rapid manner.

That the poison of snakes produces no effect on snakes of the same kind, lends no support to the probable efficacy of an inoculation in man to prevent the result of snake-poison. In the one case the result is dependent upon natural conditions, naturally and normally inherent in the individual forms, and there is nothing whatever to justify an analogy with the other set of conditions which are foreign to the human organism. It would seem possible to inoculate against snake-poison when it has been allowed or has been shown to be possible to inoculate against such a poison as strychnine? By this use of the term inoculation is meant, not the injection of a remedial measure after the poisoning-agent has been introduced into the system, but the introduction into the system of some agent which should preclude the possibility of the action of the poisoning-substance when introduced later—perhaps after the lapse of years.

So far it has been my lot to meet with only one undoubted professor of this inoculation theory, one who professed to such an extent, that he was ready to inoculate persons for some small fee,—but, unfortunately, when brought to the test, he collapsed utterly. In this case, moreover, the belief was held by an individual gifted with extraordinary credulity, for he not only believed

that the manufacturer of the inoculating substance possessed such a power over snakes that, at his whistle, the snakes in the bush within reach of the sound would be obliged to go to him, and that this same person passing by my case of living snakes in the Museum would cause them to fall dead by the mere act of passing; but—to take a rather different example—that the introduction of some special liquid mixture into the body of a young woman, did actually produce an enormous number of hair-pins in her system—an occurrence, I was assured, that was established on the testimony of persons of undoubted veracity, and among them the doctors who attended the young woman! It is needless to say that the professor professed too much on this occasion, when I had no living poisonous snake in the Museum; though at a later meeting, when I had a living though a harmless labarria in the case, he professed too little as regards inoculation. For then, he not only refused to handle the harmless land-camoodie, and the presumably dangerous labarria, but declared, in spite of previous promises and protested desires, that he would not submit himself to any experiments with poisonous snakes—though effectually inoculated and indeed a professing inoculator—no! not for a thousand dollars! and not only that but he would not allow his mixture to be tested even on animals—nay rather, he was going to cast it into the river! And certainly under the circumstances, I believed that the river was about the fittest place for it. Here, at least, the presence of an undoubtedly poisonous kind of snake, (as I have said, the snake was really harmless, for it fangs had been taken out; but, of course, I did not mention this interesting fact) had had a very curious effect

on one who was not only an inoculated individual, but an inoculator, who, till then, had ostentatiously invited experimentation with poisonous snakes, not only on animals injected with his mixture, but on himself.

This failure of the professor, however, though it casts an unpleasant light on the question, does not really affect it: still, it seems to me, from the considerations brought forward in the foregoing pages, that there is not a tittle of foundation, at present, for a belief in the efficacy of inoculation against snake-poison.

Edward Waterton.—I am indebted to Mr. RODWAY for calling my attention to the fact that in "Walford's Antiquarian" for September, an obituary notice appears of Mr. EDWARD WATERTON, the only son of that most zealous traveller and entertaining writer, CHARLES WATERTON. Mr. EDWARD WATERTON inherited neither the roving disposition of his father nor the scientific bent of his mind for the study of Natural History. He was particularly interested in antiquarian researches; and in certain branches, more especially in the literature of the "De Imitatione Christi", he was a distinguished specialist. He had accumulated at the time of his death between 1100 and 1200 different editions and manuscript copies of the work, and for a considerable period he had been engaged in writing a history of his favourite book.

A Lady's Museum Record.—Through the kindness of a lady who lately spent about three weeks up the Demerara river, the Museum has benefited by the donation of a collection of about 200 insects of various sorts, comprising butterflies, moths, beetles, flies, bees,

grasshoppers, walking-leaves, walking-sticks and cicada-like flies, very many of them new to the Museum collection. A most interesting feature in the gift is the fact that the insects were not simply presented, but were collected by the lady herself who gave them; and this, as measured by the muscular effort required to procure them by means of the catching-net, and the care and trouble necessitated in pinning and fixing them in the camphor-box, is as commendable in the donor as it is welcomed by the Museum. It forms a splendid record of the personal desire to benefit and help on the colonial Museum, even at the expense of the fatigue and uncomfortableness resulting from such an expenditure of energy in the tropics; and as such it called for this special reference, both for its own sake, and for the sake of creating some beneficial emulation. There does not seem to me to be any liberty in, or objection to, my mentioning that the lady referred to is Mrs. JENMAN.

Fungous disease of Tanniers and Eddoes (Colocasia).—Through the kindness of Mr. WILLIAM FAWCETT, B. Sc., Lond., Director of Gardens in Jamaica, I am enabled to give a short account of a fungous disease which has appeared on "Tanniers" and "Eddoes" in Jamaica. As these vegetables form a large portion of the food of the poorer classes, the subject is one of considerable importance; and it is possible that the disease prevails, or may appear, in the colony. The subject has been worked out by Mr. GEORGE MASSEE, and the results published in the Journal of the Linnean Society, vol. XXIV.

The disease which is caused by a fungus *(Peronospora*

trichotoma), closely allied to the well-known and destructive potato-fungus, appears in the substance of the "tuber" or "head", in its incipient stages, under the form of a number of minute bright yellow spots, corresponding to the vascular bundles which are always attacked first: at a later period these spots become brown or blackish and the intermediate parts brown; and eventually the whole tuber, with the exception of a narrow peripheral portion, becomes blackish and decayed.

The disease seems to be confined to the tubers or heads, or at all events is there first noticeable; and it only enters these "heads" where they have been damaged—as for instance, where the skin has been broken, either by the tearing off of an offset, or by a wound from an instrument. It does not appear that the fungus could penetrate the outer layer or "skin" of the head. When these heads, therefore, are cut or broken, the pieces, before being planted, should be placed for a time in a dry place, so that a protective layer may be developed over the injured portions. This would prevent an entrance of the disease.

All diseased plants should be wholly destroyed by *burning*, since after being buried or after being used as food for animals, the reproductive bodies or "spores" which possess great power of vitality, might still survive. As the offsets of diseased "heads", even when quite young, contain the fungus in their tissues, these should also be burnt. By these methods, the disease would soon be stamped out.

Labarrias born in the Museum.—A short time back, the interesting occurrence of the birth of eight labarrias

took place in the large case containing the living specimens of snakes in the Museum. The parent form had been sent down from the upper Demerara river, but unfortunately the poison-fangs had been removed, and in this operation the mouth of the snake had been considerably lacerated. The shock to the system, caused by this and other rough treatment, had a very marked effect on the snake, for it died the morning after the young ones were brought forth; while four of its young ones were brought forth dead, and of the other four, only one survived its parent for about three days. Unlike the parent, the little snakes were exceedingly lively, moving about from place to place, and, on a stick being placed close to them, getting into striking position and darting forward after scarcely any provocation. As a general rule, little vipers just after being brought forth are markedly active; and on this account are much more difficult to deal with than their sluggish parents. Each little viper was brought forth enclosed in a soft delicate membrane and with a considerable portion of the egg-mass unabsorbed; and, after resting where first deposited, for about from two to five minutes, the living forms quickly separated themselves from the mass and moved restlessly about the case. A period of nearly two hours elapsed between the birth of the first and last of the eight. An extremely interesting fact is brought to light by this knowledge of these infant vipers—namely that they differ markedly from the adult forms in their coloration. Thus instead of having the dull-brown and yellowish-white tint of the parent form, these little creatures were marked with very rich and variable tints of ruddy-brown and chocolate-red, arranged in more or

less evenly paired triangular areas on each side, on a pale yellowish-brown or maize-coloured ground; while the tail was of a lively yellow colour. They were 10 inches in length and possessed extremely fine and needle-like curved fangs about ¼ of an inch long. From these characters, it is obvious that the yellow-tailed labarria, described by Dr. BANCROFT as being a small snake attaining a length of about 14 inches, is nothing more than the young of the common species.

The Sugar in Sugar-cane.—The following note bearing on the article *Some Experiments on Sugar Cane** has been sent me by Mr. FRANCIS:—

The following Extract from the *Produce Market Review*, given in the Demerara *Daily Chronicle* for August, 13th, 1887, will show how erroneous are the current ideas respecting the cane sugar industry, and the proportion of sugar in the plant:—

" Our planters console themselves with the idea that the cheapness " of European Sugar, in the markets of the world, is due to bounties, " and to a trifling extent this may be the case in countries near the pro- " ducing districts. But the main reason for its cheapness is perfection " in cultivation and manufacture. Indeed, no more striking illustration " of the moral of the old fable of the hare and the tortoise could be " chosen, than the change in the relative positions of the towering Cane " and the humble Beet. The former from time immemorial has " contained 18 per cent. of saccharine matter, by weight, from which " most of our Planters extract, in a debased form, 6 per cent., or one- " third of the Sugar the plant contains. The mangold, the original, " form of the Sugar Beet, contains 4 per cent. of Sugar. The Germans " last season from improved varieties of Beet, extracted close on 12 per " cent. of their weight, to a great degree in the form of pure White " Sugar fit for direct consumption, or about three times what would be " produced from the root not so many years ago. It is to progress " like this, and not to bounties, that the cheapness of European White

* See *Timehri*, New Series, Vol. 1, Part 1.

"Sugar is due, and if our Cane Planters have a rude awakening by "finding their own home markets invaded by Germany or Austria, it "may at length cause them to realise their position, and to ask how "they can continue to make a profit if they sacrifice two-thirds of their "possible income."

It may interest the *Produce Market Review* to know that average cane, yielding juice of $9\frac{1}{2}^{\circ}$ Bm., only contains about *13 per cent.* of total sugar (sucrose and glucose), and the prevailing methods of manufacture enable from *9 to 11 thirteenths* of that quantity to be obtained as sugar, molasses and rum. Doubtless, *Diffusion* will help planters to the remainder, but that is as yet unproved.

Export of Plants and Bird-skins.—Special attention has recently been drawn to this subject in the annual report of the Government Botanist; and to meet it efficiently in the first case it has been proposed that a small tax be placed on all plants exported—if only a nominal tax—in order not only to secure an accurate return of articles exported and to protect the plants that are thus subject to being considerably thinned if not exterminated, but also that the colony should thus benefit from its natural and valuable products. Certainly this is an advisable step, and one more worthy of consideration than an alternative scheme, that has been mentioned to me as likely to be enforced, namely that a lump sum should be fixed, on the payment of which, a licence should be granted to collect and export plants for a time specified. In the former case the tax imposed would fall equally on all exporters, besides securing an accurate return; while in the latter case not only would a small export of a few very interesting plants be practically prevented by a prohibitive licence, the cost of which would necessarily be out of all proportion to, say a dozen or two dozen, plants which it might be desired to have exported; but the

large exporter would scarcely feel the imposition of the charge for a licence unless it were unduly high.

As regards birds, the question is somewhat more simple, for by the provisions of the Ordinance for the protection of wild birds, extremely stringent regulations exist against their being killed at all. Thus unless a special licence has been granted by a Governor of the colony for killing and exporting wild birds, only those few wild birds, such as the more commonly known "game-birds," which are specified in the second schedule of the Ordinance, are allowed to be killed during certain months of the year, such months being from September to March inclusive. Beyond this, except to Indians, all other birds are practically forbidden to be killed at any time whatever, under a penalty of $24 per bird or part of a bird, unless it can be shewn that such bird or birds had been killed for the purposes of food, and at a distance of more than 10 miles from a sugar plantation. I say practically, for by the terms used in the first schedule of the Ordinance, the birds named comprise nearly all birds, since while one or two refer to individual birds, the other terms denote whole groups, such as cotinga, cassiques, humming-bird, hawk, woodpecker, creeper, jacamar, kingfisher, trogon, toucan, shrike tanager, etc., among which are included all the familiar and rare birds of gorgeous plumage. It may perhaps be doubted whether such a wide application was intended by the original legislators; but, however that may be, the terms used in the Ordinance are thus really inclusive and prohibitive.

Value of Gold to the Indians in the Past.—The following extract from the "Table of Rivers etc. of

Guiana, HAKLUYT'S Voyages, Vol. 3," confirmatory of the opinion, expressed in the article *The Guiana Gold Mines of the Past,** that gold was highly valued by the Indians of South America at the time of its discovery, has been given me by Mr. RODWAY :—

"This river, (the Corantyne) as also most of the rest, is not navigable above six days' journey by reason of rocks. It is ten days' journey to the head, where the Guianians do dwell. Honey, yarn or cotton, silk, balsamum, and brasil-beds, are here to be had in plenty, and so all the coast along eastward. Some images of gold, spleenstones, and others, may be gotten on this coast, but they do *somewhat extraordinarily esteem of them, because everywhere they are current money.* They get their moons, and other pieces of gold, by exchange, taking for each one of their greater canoes, one piece or image of gold, with three heads; and after that rate for their lesser canoes, they receive pieces of gold of less value. One hatchet is the ordinary price for a canoe."

The Cocoa Industry and Insect Pests.—One of the most pleasing and promising features in connection with the minor industries of the colony, has been the rapid development of, and advance in, an export trade in Cocoa. In 1886, which was the first year of export, the quantity amounted to less than 2,000 lbs., while in 1887, it has amounted to more than 13,000 lbs. The markedly high appreciation, by English experts, of the British Guiana cocoa and the prices realisable, give promise not only of a continuous successful development, but of a chance of ousting the hitherto more successful competitors from the first place in the market, when the best methods of preparation, on which its appreciation will really depend, have been adopted and become normally recognised. The Government Botanist has already, in his annual report, pointed out the special adaptability of

* See *Timehri,* New Series, Vol. I., part I.

this colony for the successful growth of cocoa—an opinion fully borne out by the quality of that which has been already produced and reported upon—and the special suitability of the industry for agriculturists of limited means ; and it is to be hoped that the industry which has received such an impetus at its start will attract the attention which it deserves in the colony. That the cocoa plants are preyed upon by certain pests, is doubtless already well-known. Mr. JENMAN, in the report referred to above, mentions a fungous disease, as occurring on plants from the Demerara river, though he was inclined to believe that the fungous growth was the result rather than the cause of the unhealthy condition of the trees. Some time ago Mr. R. J. KELLY shewed me a pod which had been eaten through on one side, and was infested within with flies, producing quite an unpleasant odour ; but from the nature of the opening it seemed that some other being had eaten away a portion of the pod, and that the flies had but taken advantage of the opening to make themselves at home. A really serious pest to the cocoa plants, however, exists in certain forms of beetles, the young grubs or "worms" of which bite into the young shoots and bore along the pithy centre of the plants, gradually causing them to wither away until the tree is killed. This "disease" is, I have heard, extremely prevalent in the cocoa plantations in Surinam, and during this last year has been found, though not to any serious extent, in the Essequebo cocoa plantation belonging to Mr. WILLIAM SMITH. Through the kindness of Mr. BOSCH-REITZ, through whom the matter was first brought under my notice, I have been supplied with the three stages of the insects which thus attack these

plants in Surinam, and from the resemblance of their grub-forms to those obtained from the Essequebo plantation, it is most probable that the adult forms are identical in the two cases; though as I have not yet been able to obtain adult forms from Essequebo, I cannot express any certainty in the matter. The method of operation in the two cases is at any rate the same. The young shoots or branches are primarily attacked; these wither away, and the death of the tree follows unless steps are taken to chop off the infected parts. When these damaged shoots are examined, it is found that the grubs, which are yellowish-brown or whitish, thick, maggot-like worms, from one to two inches in length, and with extremely strong biting jaws, have bored through the central delicate tissue, the point of access being generally situated towards the basal part of the shoot, where a scarcely visible gummy exudation indicates the puncture or perforation made. The adult forms brought for me by Mr. BOSCH-REITZ from Surinam, belong to two species, and specimens of each of these have been exhibited before the Royal Agricultural and Commercial Society and are now exhibited in the Museum. They are both Longicorn beetles; that is, they possess long, jointed feelers or *antennæ* on the head, and these are carried like horns. One form, the smaller, is black, rather short and broad, and with longitudinal lines or *striæ*, like small ridges; the other is rather long, smooth, nearly black, but abundantly yellow-spotted, and provided with lateral spines on the thorax. They have been examined for me by Mr. C. O. WATERHOUSE, the Coleopterist of the British Museum of Natural History; and the smaller black specimens belong

to the species *Stirastoma depressa* ; while the yellow-spotted forms belong to the species *Tæniotes farinosus.*

So far I have had no opportunity of tracing out the earlier stages in the life history of these forms ; and until this is done it will be impossible to suggest any remedies that are likely to be really effectual. It is probable that the beetles deposit their eggs in the young bark bored out for the purpose or in the inequalities of the old bark, though it is possible that they may be placed about the roots of the tree. In all of these cases, the " kerosene emulsion" is likely to be advantageous. This insect-destroyer is prepared by dissolving ½ ℔ soap in one gallon of water and adding the mixture boiling-hot to two gallons of kerosene oil. The whole should be well churned by a force-pump, so as to ensure a perfect admixture, otherwise the constituents separate on cooling, and the stuff becomes unsuitable for application. Each gallon of the perfect mixture should then be diluted with nine gallons of water; and this strength is that which is generally applied to plants infected with blight and scale-disease or insect pests generally. The great recommendation of this mixture is found in the fact that while it is a most beneficial insect-destroyer, it has no deleterious influence on the tree, if the ingredients are thoroughly mixed. All parts of the tree on which eggs or young grubs are detected should be thoroughly syringed ; though it would be advisable to test first the strength of the mixture, in case further dilution be necessary for the treatment of the tender shoots of cocoa plants.

It is obvious that, as the adult beetles are the real offenders since the grubs hatch out from the eggs de-

posited by them, they must be ruthlessly destroyed where possible ; in fact the trees should be carefully watched so as to prevent as many of the insects as possible from laying. All affected young shoots which shew signs of withering, should be cut off below the point at which the central perforation is visible ; and these shoots should be burnt, not buried—so as to ensure the destruction of the grubs and pupæ. It is very advisable that those who have charge of cocoa plantations should observe carefully the method of egg-laying, and the incipient stages of the work of these insects ; for not until this knowledge is at hand, will it be possible to know what is the most efficacious and advantageous method of warfare that can be adopted.

William Fresson: Died November 22nd, 1887.

HARDLY more than a month ago, the Royal Agricultural and Commercial Society lost, by the death of Mr. FRESSON, one of its oldest members; and the Museum, one of its most constant supporters. Mr. FRESSON had been for more than 20 years an influential member of the Society, and had been identified with all its various movements aiming at the extension of its usefulness. From the commencement, as a member, and later on as the Secretary for many years, of the Committee of Correspondence, he had closely identified himself with the Local Exhibition movement; and on many occasions he had rendered valuable services not only in their successful organisation, but also in increasing their efficiency by the exhibition of important and interesting objects. In connection with the extra-colonial Exhibitions and more particularly with the Colonial and Indian Exhibition, he had also rendered considerable assistance towards the suitable representation of the colony. He was, moreover, even more closely identified with the general history of the Museum, since on two separate occasions, in the first place after the death of Dr. WHITLOCK, and in the second after the death of Mr. GLAISHER, he had acted as Curator for a considerable period.

Report of the Meetings of the Society.

Meeting held on 14th July.—Mr. G. H. Hawtayne, C.M.G., in the chair.

There were 18 members present.

Elections.—*Member :* Mr. Justice Sheriff.

Associates : John McIvor, W. T. McWatt, Hackett Bracey.

Mr. Hawtayne in terms of previous notice moved :

That a series of evening popular Science lectures be given under the auspices of the Society, and that a Committee be appointed to make the necessary arrangements.

The object of the Society being to foster Agriculture and Commerce in the colony, he believed, knowing how much both are indebted to science, that a man employed on a plantation would be none the worse planter for knowing something of science, and it would certainly be an advantage to the commercial man to be acquainted with the scientific history of the things in which he dealt. His idea was to make these lectures open to the public under certain regulations ; that is to say, he proposed that each member of the Society be supplied on application with a certain number of free tickets admitting the outside public, but he looked to the members themselves for the chief support of the scheme.

The motion was briefly seconded by the Rev. John Foreman and supported by the Hon. B. Howell Jones, and, upon its being put to the meeting, was unanimously

carried—the nomination of the Committee being left in the hands of the President and Vice-President.

The Chairman said the next matter on the agenda of the day was to decide about the continuation of the night opening of the Reading-Rooms, which during the experimental period of six months did not appear to have been appreciated by the members, the average attendance being only a little over four persons per night, gradually falling away from six in February, to only three per night in June—the expenditure involved being about $20 per month.

The Secretary having stated, in answer to an enquiry, that the attendance was somewhat above the average on mail nights and the night following,

Mr. George Garnett moved and Mr. Daly seconded "that for a period of three months from the 1st August the Reading-Rooms be opened only on the nights of arrival of the English mail and following night." The motion was carried.

The Hon. B. Howell Jones gave notice of the following motion:—

The trade in bananas and other fruit being one which might be of great advantage to the colony, be it resolved—

That the Agricultural Committee correspond with the Boston Fruit Buyers Association, and any other such Society in America, and obtain any information in reference to the fruit trade which would be applicable to this colony.

The Rev. J. Foreman gave notice of the following motion:—

"That the offer made by the Hon. B. H. Jones of 12 barrels of Limes for exportation, be accepted by the Society; and that the Agricultural Committee be requested to send these limes to Europe and North America, in such manner and in such quantities as the Committee

may deem best, and to report the results to the Secretary of this Society."

Also of the following questions:—

(1) What steps have been taken since the meeting of the Society on the 5th May to obtain the Arrears of Subscriptions due on *Timehri* for the years 1883, 1884, and 1885, then amounting to $341:46; and how much has been thus obtained?

(2.) What efforts have been made to collect the subscriptions due on *Timehri* for 1886, and how much has been thus collected.

(3.) What has been done by the Agricultural Committee of this Society to utilise the sum of $2,000 placed at their disposal by the Directors, out of the balance in hand of the funds of the Society at 31st December, 1886.

The following letters from the Acting Government Secretary, were read:—

No. 4,199, 24th June, 1887,—Referring to an offer of the Rev. John C. Brown, LL.D., to present to free libraries in the Colonies, copies of his publications on Modern Forestry.

No. 4,228, 21st June, 1887,—Forwarding by direction of His Excellency the Lieutenant-Governor, a copy of a report (in French) by Prof. E. Reuss of Nancy, on the Forestry Exhibition at Edinburgh in 1884.

No. 4,227, 21st June,—Forwarding Circular Despatch from the Colonial Secretary of State *re* Centennial International Exhibition, Melbourne, 1888.

The thanks of the Society were accorded for the same.

No. 4,199 was referred to the Book Committee, and
No. 4,227 to the Committee of Correspondence.

In regard to the latter, however, the view of the meeting was that the colony had participated in quite enough exhibitions for the present.

The thanks of the Society were accorded to the Rev. Joseph Ketley for a framed portrait of Sir Robt. Schomburgk presented by him.

Mr. J. J. Quelch, Curator, exhibited the following specimens, and gave explanatory remarks on them :—

(1.) A specimen of a monstrosity of the pine-apple, which had been forwarded to the Museum by Mr. T. C. Duggin of New Amsterdam. It consisted of a mass of coalescent stems forming a stout base, many of the stems separating above and bearing single pines, while several others bore from four to five. The pines were quite small, but had ripened. The one mass which originally bore more than 20 pines, and presented a very good instance of fasciation, was obtained from the higher parts of the Berbice river. A photograph of the pine is exhibited in the Museum.

(2.) A specimen of Venus' Flower-basket *(Euplectella aspergillum)* a not uncommon six-radiate siliceous sponge. The specimen probably came from the neighbourhood of the Philippine Isles.

(3.) Specimens of the Hyoid pouch of the Howling Monkey *(Mycetes seniculus)*, male and female, showing the small capacity for noise in the female.

(4.) A specimen of Tortoise *(Kinosternon,* sp.*)* from Berbice, with a 3-keeled shell, a clawed tail, and a very acute pointed jaw.

The meeting then terminated.

Meeting held on 11th August.—Mr. P. H. Nind, M.A., Vice-President, in the chair.

There were 18 members present.

Elections.—*Member :* Revd. S. Grant.

Associate : J. F. Bollers.

The chairman informed the meeting that the following Lecture-Committee had been nominated by the President and Vice-President—

Messrs. P. H. Nind, R. P. Drysdale, E. Percival, and Hon. B. Howell Jones.

A meeting of the Committee would soon be held and matters put in train for commencing the proposed series of evening lectures.

A letter was read from the Secretary of the Committee of Correspondence, forwarding a report on the

Trade, Commerce and Agriculture of the colony, prepared by the Committee according to the requirements of, and suitable for insertion in, the Board of Trade Journal. Ordered to be forwarded to the Government Secretary.

In the absence of Mr. Howell Jones the motion, in reference to the trade in bananas and other fruits, standing in his name, was allowed to stand over.

The Rev. J Foreman moved the resolution of which he had given notice, as follows :—

That the offer made by the Hon. B. Howell Jones of 12 barrels of limes for exportation, be accepted by this Society ; and that the Agricultural Committee be requested to send these limes to Europe and North America, in such manner and in such quantities as the Committee may deem best, and to report the result to the Secretary of this Society.

His object in making this motion was to endeavour to find a suitable market for limes, which, he was informed, were grown in great quantities in several parts of the colony, and for which there was no trade opening whatever. It was a question to be decided which was the most profitable mode to deal with the fruit, whether to ship the expressed juice or the limes themselves.

The motion was seconded by Mr. Hawtayne, who referred to the prominent part played by the island of Montserrat in last year's exhibition in regard to limes and lime-juice, and to the large quantities of the fruit and concentrated juice annually shipped from that island.

Mr. Kelly, as Chairman of the Agricultural Committee, mentioned that the Committee had already accepted Mr. Jones's offer, and intended making arrangements for shipping 10 or 12 barrels to the States and to England.

Mr. Cameron, Mr. Garnett and the Vice-President

supported the motion, the last-named expressing his pleasure at seeing a growing desire to promote the minor industries of the colony He suggested that the Agricultural Committee, in making experiments in the limes, should also direct their attention to the growth of oranges, the soil and climate of this colony being, in his opinion, pre-eminently suitable for their cultivation.

The motion having been put to the meeting, was carried unanimously.

Replying to the Rev. J. Foreman's questions nos. 1 and 2, notified at the previous meeting, the Secretary said that special circulars had been issued by him to all subscribers to *Timehri*, who were in arrears of subscription, requesting immediate payment to the Honorary Treasurer. The latter explained that as a result of these circulars he had received, since the 5th May, $223 48 of the amount due for arrears of subscription, which then amounted to $341 46.

In reply to Mr. Foreman's third question, notified at the last meeting, Mr. Kelly said the Agricultural Committee had practically done nothing up to the present in regard to expending the $2,000 placed at their disposal by the Society for experimental cultivation of fibres and other products. As the members were aware, the proposal of the Committee in regard to working an experimental section at the Botanic Gardens was not favourably entertained by the Government Botanist nor by the Government itself. And when the Committee contemplated taking advantage of Mr. Jones's offer of a piece of well drained land at Pln. *Houston* for the purpose of making experiments in the growth of fibres, they were disheartened by a paragraph in the report on

Fibres, by Mr. Cross the expert at the Colonial Exhibition.

After a few remarks from Mr. Hawtayne and the Vice-President, it was suggested that the Agricultural Committee should further consider Mr. Jones's offer, and report on the suitability of the land and on the expenses of carrying out experimental cultivation thereon.

Mr. Thos. Watt gave notice of the following motions :—

(1.) That the Agricultural Committee be requested to furnish a report at an early date as to the prospects of banana cultivation in this colony, as an article of export.

(2.) That three months hence I shall move that the resolution abolishing the opening of the Reading-Rooms at night, be rescinded.

Mr. Hawtayne gave notice that, at the next meeting, he would move :

That His Excellency the Governor be asked to supply, through the Government Botanist, specimens of our hard-wood and other woods, in sections, with bark, leaves, inflorescence and seeds, on cards similar to those exhibited by the Japanese Government at the Forestry Exhibition in Edinburgh, and by the Government of South Australia at the Colonial and Indian Exhibition of 1886, for the purpose of exchange with Museums and Associations.

In the unavoidable absence of the author the Secretary read a paper by Mr. Wm. Price Abell on *Notes on Steam boilers applicable to Sugar Estates.**

It was suggested that the paper be brought up for discussion at the next meeting, and be placed, in the meantime, at the disposal of the press. On the motion of the Vice-President, seconded by Mr. Steel, the thanks of the Society were accorded to Mr. Abell, and the Secretary was directed to ask him to attend the next meeting.

Extract letters were read from Mr. Walker, Resident

* This paper is printed on page 320.—ED.

Director in London, dated 14th June and 13th July, referring to the Venezuelan boundary question, and Ridgway's bankruptcy.

Concerning the former, Mr. Walker writes :—

A Committee has been formed in the city to watch over the proceedings of H. M. Government in connection with this question, and the compliment has been paid me of asking my attendance at its meetings which I have not hitherto been able to do. I have, however, been assured from another source of information that the despatch which has naturally caused so much excitement meant less than it expressed, and was not intended in any way to repress or discourage enterprise in exploring the disputed territory for gold (July 13th).

Concerning the latter he forwards the information, dated 9th July, from the Official Trustee, that although the best had been, and was being done to bring matters to a satisfactory issue, there was no likelihood of a dividend being declared before some time had elapsed.

Ordered to be taken for notification.

A letter from the Government Secretary, dated 9th August, was read, enclosing letter dated 29th June from Mr. H. S. Durden, Secretary of the State Mining Bureau, California, asking to be furnished with specimens of greenheart and other colony woods, in exchange for specimens of Californian woods and mineral ores.

On the suggestion of the Secretary, the letter was referred to the Committee of Correspondence in order that a collection of woods might be obtained from Messrs. Park and Cunningham or otherwise, and exchanged with Mr. Durden for suitable Museum specimens.

A letter from the acting Government Secretary was read, forwarding by direction of His Excellency the Lieutenant-Governor a copy of the Blue-Book for 1886. The thanks of the meeting were accorded for the same.

Mr. Quelch exhibited the following recently added Museum specimens, and offered some explanatory remarks on each :—

(1.) A specimen of the Bell-bird *(Chasmorhynchus)* apparently a young male in transitional plumage, also a rare long-tailed Tyrant Shrike *(Milvulus)* from Mazaruni, presented with other specimens by Mr. James Winter.

(2.) An egg of the Rhea or American Ostrich *(Rhea americana)* from La Plata, presented by Capt. Smart.

(3.) A large scorpion-spider *(Phrynus)* from the Essequebo, presented by the late Rev. William Harper.

(4.) Specimens of Beetles,* with grubs, pupæ and adult forms, destructive to Cocoa-trees, from Surinam, presented by Mr. Bosch-Reitz.

On the motion of Mr. Hawtayne the Secretary was instructed to record on the minutes, the regret of the Society at the death of the Rev. William Harper, M.A., an old member who had frequently given them the benefit of his researches, and also to record their sympathy with his widow.

The meeting then terminated.

REPORT FOR THE BOARD OF TRADE JOURNAL.

Customs Tariffs.—At a meeting of the Combined Court held in Georgetown, Demerara, May 18th, 1887, and following days, it was decided that no alterations should be made in the Customs Tariffs.

Trade and Industry.—(1) The chief movements as affecting Trade and Industry are the following :—

(A.) Insurance Tax.—At the meeting of the Combined Court, held in Georgetown, Demerara, May 18th, 1887, and following days, it was decided that a tax of $250 should be placed on all Life and Fire Insurance offices, carrying on business in the colony.

* These specimens are referred to on page 352.—ED.

(B.) India Rubber and Balata Royalty.—By the passing of the Crown Lands Ordinance a royalty of one cent per pound weight on all India-rubber, Balata and Gums exported from the colony will come in force on October 1st, 1887.

Crown Lands Ordinance.—The passing of the Crown Lands Ordinance, 1887, which gives a chance of more systematic working in the forests for various valuable vegetable productions will tend to the encouragement of various industries which are capable of very great development.

(C.) Gold Royalty.—By the passing of the regulations for Gold-mining, a royalty of 3/9 per ounce is levied on Gold, and twopence per ounce on silver obtained in the colony.

Development of the Gold Industry.—The principal movement likely to affect the trade of the colony is the continued advance of the gold industry—a development that is highly advantageous during the present time of depression in the sugar industry. Gold has now taken the fourth place in value among the exports of the colony. Considerably more than 2,000 labourers are at work in the gold fields, and numerous companies and private individuals are engaged in the industry. During the first six months, 1887—4,991 oz. 13 dwt. 17 grs. were exported as against 6,518$\frac{3}{40}$ oz, in the whole of 1886 and 939$\frac{3}{4}$ oz. in 1885. Regulations for the better and systematic conduct of the industry have been enacted under the Gold-mining Regulations, 1887.

2.—IMPORTS AND EXPORTS.

Value of Imports.—The total value of articles imported into the colony during 1886, amounted to £1,436,297 17 10½ distributed among the following countries:—

United Kingdom	... ...	£ 787,052 10 1½
British Colonies	... ...	284,219 15 9
Foreign Countries	... ...	365,025 11 2

Value of Exports.—The total value of articles exported from the colony during 1886, amounted to £1,842,585 9 9 distributed among the following countries:—

United Kingdom	... ...	£1,071,432 0 0
British Colonies	... ...	81,054 0 7
Foreign Countries	... ...	690,099 4 9½

The exports of chief mention, as serving to illustrate the Trade and

Industry of the colony, are the following, arranged according to value and quantity :—

1. Sugar, 124,283 $\frac{5}{12}$ hogsheads	£ 1,457,740	18	2
2. Rum, 24,773 $\frac{2}{3}$ puncheons	153,596	14	8
3. Molasses, 20,001 casks	55,763	4	1
4. Gold, 6,518 $\frac{3}{40}$ ounces	23,342	3	8
*5. Timber, 222,968 feet	14,205	16	4
6. Charcoal, 65,781 packages	6,806	0	7
7. Balata, 67,828 pounds	2,978	18	7½
8. Hides and Skins, 5,889 skins	2,016	3	0
9. Gums, 40,466 pounds	1,793	19	5
10. Plantains and †Plantain Suckers ...	1,269	0	0
11. Shingles, 1,687,650 shingles	1,003	5	7
12. Cocoa-nuts, 283,775 nuts	752	14	11½
13. Fish Glue, 7,641 pounds	625	2	9
‡14. Cocoa, 1,968 pounds	52	2	6

* Greenheart.

† An export of very recent date in any quantity.

‡ First year of export.

Meeting held on 22nd September.—Mr. Justice Kirke, M.A., B.C.L., President, in the chair.

There were 11 members present.

Elections.—*Associates :* W. A. Hosking, H. C. Porter, J. H. Field, J. C. McKenzie.

A letter from Mr. Quelch, Honorary Secretary to the Committee of Correspondence, was read, stating that steps had been taken to procure, through Messrs. Park and Cunningham, specimens of colony woods to be forwarded to Mr. Henry Durden, Secretary to the State Mining Bureau, San Francisco, in exchange for specimens of Californian Ores and Minerals to be placed in the Local Museum. Seventy-two specimens of the required size, polished on one side, had been obtained at a cost of 32

cents each, and would be sent on by the next trip of the s.s. *Barracouta.* The letter was ordered to be taken for notification.

The Hon. B. Howell Jones moved the motion standing in his name, laid over from the previous meeting, in reference to fruit shipments. He felt satisfied, judging from the results of experimental shipments already forwarded to England by the steamer *Non Pareil* from this colony, and from more extensive shipments to the United States from Honduras, Cuba and Jamaica, that a most successful trade in fruit, more especially bananas, might be established between this colony and the States as well as the Mother Country. He advocated the subsidising by the Government of a special line of steamers between the colony and North America for the encouragement of the fruit trade, and suggested that the Society should correspond with the Fruit-Growers' Association in America and other kindred Societies elsewhere, with a view to developing the trade. He considered that the Local Government shewed great apathy in matters connected with agriculture, and instanced the lack of interest taken in recent experiments on the diffusion process of sugar manufacture at Pln. *Non Pareil.*

Mr. R. J. Kelly, in seconding the motion, mentioned that Major Bunker, United States Consul, had shewn him a letter in which a firm in the States had expressed a willingness to send steamers here twice a month, if there was a reasonable prospect of procuring shipment of bananas. He had hoped that a communication on the subject would have been forwarded to the Society by Major Bunker.

Mr. D. C. Cameron in supporting the motion, men-

tioned that in his capacity of Secretary to the Agricultural Committee he had sent out numerous circulars of enquiry to planters, clergymen and others, soliciting information as to the prospects of fruit cultivation in the various districts of the colony, but up to the present time only three replies had been received. In the meantime the Committee had shipped to New York, to the care of Messrs. Laycraft & Co., 10 barrels of limes, procured from Mr. Howell Jones, as an experiment, the result of which would be laid before the Society in due course.

The President having expressed satisfaction at the action taken by the Agricultural Committee, put the motion to the Meeting, and it was unanimously carried.

In the absence of Mr. Thomas Watt, a motion standing in his name on the same subject of fruit-shipments, was struck off, it being considered that Mr. Jones's motion met the same object.

In the absence of Mr. Hawtayne the motion standing in his name in reference to the collection of specimens of colony woods in section, &c., was ordered to stand over.

The Secretary on behalf of the Rev. John Foreman gave notice of the following motions :—

(1.) "Whereas Her Majesty Queen Victoria is the Patroness of this The Royal Agricultural and Commercial Society of British Guiana: Be it resolved—That the sum of One Hundred Dollars of the funds of the Society, be given towards the erection in this City of Georgetown, of the permanent Memorial of the Jubilee year of Her Majesty's reign.

(2.) That the Agricultural Committee and the Book Committee, meet in alternate months after the Monthly Meetings of the Society."

Mr. Wm. Price Abell's paper on *Notes on Steam Boilers applicable to Sugar Estates*, read at the previous meeting, was brought up for discussion.

The Secretary read a letter from Mr. Abell excusing his absence from the Meeting.

Mr. Howell Jones said that although the paper contained very few new facts in regard to steam boilers, it had evidently been very carefully prepared, and he thought it was the duty of the Society to encourage such papers from the professional members of the Society. He regretted the absence from the meeting of all the estates' engineers, from whom some interesting remarks on the subject of the paper might reasonably have been expected.

A letter from the Acting Government Secretary dated 25th August, was read, acknowledging the receipt of the Report on the Trade, Commerce, and Agriculture of the colony, prepared by the Committee of Correspondence for the Board of Trade Journal. Ordered to be taken for notification.

Extracts of letters from Mr. Wm. Walker, Resident Director in London, dated 27th July, and 10th and 24th August, were read, referring to the Venezuelan Boundary question and other matters of minor importance.

Concerning the former, after mentioning the presentation by the Boundary Committee, of the petition from the people of British Guiana praying for the settlement of the Boundary question, Mr. Walker writes :—

I am not aware that any substantial progress has been made in regard to the adjustment of the boundary between British Guiana and Venezuela, but it has attracted more attention than is usually vouchsafed to matters of essentially colonial interest. (August 10th.)

As I am invited to attend a meeting of the British Guiana and Venezuela Boundary Committee in the city to-morrow, I infer that the proceedings of the Government in regard to that important question are being carefully watched, by those directly interested (August 24th.)

A paragraph referring to a new Atlas published by Mr. Stanford, was referred to the Book Committee, and the other matters were taken for notification.

A letter from the Government Secretary, dated 5th September, was read, forwarding by direction of His Excellency the Governor, a recently published map of British Guiana. Ordered that the thanks of the Society be accorded to His Excellency for his attention.

The thanks of the Society were also accorded to Mr. Hawtayne, for his presentation of the two following books.—" Reports on the Colonial Sections of the Exhibition of 1886" and " Report of the Royal Commission of the Colonial and Indian Exhibition, London 1886."

The President laid over an extract from the London Chamber of Commerce Journal, containing conditions in regard to prizes offered for home and colonial grown tobacco. Ordered that the extract be placed at the disposal of the press in order to bring the matter to the notice of any one interested in the subject, who might feel disposed to compete.

The meeting then terminated.

Meeting held on 20th October.—P. H. Nind, M.A., Vice-President, in the chair.

There were 7 members present.

Elections—*Members:* H. A. Woodward; Capt. E. T. White.

Associates: J. D. Gillezeau, G. D. Bayley, G. H. Plummer.

Mr. Watt took exception to the manner in which his notice of motion *re* the Banana trade, had been dealt with at the previous meeting in his absence, as he con-

sidered that the motion by the Hon. B. Howell Jones did not cover the one he had intended to move which dealt more particularly with the export trade.

A letter from Mr. R. J. Kelly was read, explaining that in consequence of illness he had not been able to hold a meeting of the Agricultural Committee, to discuss the Banana question, on the subject of which a series of queries had been sent out by the Committee. He also expressed an opinion that, from information received, it appeared that the land kindly offered by Mr. Howell Jones at Pln. *Houston* for experimental purposes was not suitable for the Society's requirements.

The Secretary stated that he had received a letter from Mr. Quelch, the Curator of the Museum, expressing regret that owing to indisposition he was unable to be present at the meeting; he had intended to exhibit some recent interesting additions to the Museum including specimens of insects from the Demerara River, collected and presented by Mr. Commissary Swain, and by Mrs. Jenman. He also reported that the specimens of native woods, referred to at the previous meeting, had been forwarded by s.s. *Barracouta* to Mr. Durden, Secretary of the State Mining Bureau, California.

Mr. Hawtayne moved the following motion :—

"That His Excellency the Governor be asked to supply through the Government Botanist, specimens of our hardwood and other woods, in sections with bark, leaves, inflorescence and seeds, on cards similar to those exhibited by the Japanese Government at the Forestry Exhibition in Edinburgh, and by the Government of South Australia at the Colonial and Indian Exhibition of 1886, for the purpose of exchange with Museums and Associations."

Mr. Hawtayne thought that by exchanging such

collections with other Museums they might materially benefit our Local Museum. The specimens of our woods exhibited at previous exhibitions at home, were got up in too crude and massive a form, and were evidently badly collected and prepared, exhibiting many cracks and flaws which tended to deter intending customers from making further enquiry into the matter. Small handy specimens, such as those forwarded to San Francisco, or even smaller, were much more suitable.

Mr. Watt seconded the motion. Mr. Winter mentioned that the specimens of woods sent to the London Exhibition of 1861, were cut in sections 6 inches long by 3 inches wide and ½ inch thick, but they were objected to as being too small to show properly the texture of the wood, and it was recommended in future to send large sections with bark attached.

Mr. Nind remarked that the cracks in the large specimens sometimes arose from bad felling, and very often resulted from the drying of the blocks. There was a large demand in North America and elsewhere for suitable cabinet woods, and also woods for carriage-building, and he therefore thought that exhibiting the resources of our forests in the manner suggested by the motion was very desirable.

Mr. Hill pointed out that the collection of such complete specimens as those contemplated, would necessarily occupy a very considerable time, as unfortunately the Indians of the interior were not sufficiently observant to take note of the flowering seasons of the several forest trees, and so more than one or two visits of the collector would be necessary before the required information and specimens could be obtained.

The motion was put to the meeting and unanimously carried.

Mr. Watt elected to have his motion in reference to the re-opening of the Reading-Rooms at night, brought up at the meeting in accordance with his notice. The Secretary explained that he had put the motion on the agenda for the present meeting, thinking it would be convenient to have it discussed in connection with the three months' experimental opening of the Rooms on Mail nights only, which expired at the end of October.

It was decided to defer both questions until the next monthly meeting.

A letter from the Rev. John Foreman was read, asking that the motion standing in his name should be allowed to stand over as he was confined to his house by illness. He expressed a hope, however, that some other member might, on his behalf, move the motion in reference to a donation of $100 from the funds of the Society in aid of the permanent Jubilee Memorial of Her Majesty the Queen, Patroness of the Society.

Mr. F. A. R. Winter accordingly moved a resolution to that effect, which was seconded by Mr. L. M. Hill.

Mr. Hawtayne thought that the sum might be increased to £50, but eventually moved an amendment that a "sum of $120, be subscribed from the funds of the Society in aid of the permanent Jubilee Memorial of Her Majesty the Queen." Mr. Conyers seconded. The Chairman ruled that it was out of order to increase on an amendment the amount of a money vote, without previous notice.

Whereupon, Mr. Winter (who favoured an increased vote), with the consent of the meeting, withdrew his

motion on the understanding that the original notice would still stand good in the name of the Rev. John Foreman, and he himself then gave notice of the following motion :—

That the Directors be requested to subscribe the sum of $240 in aid of the fund for the erection in this City of a Permanent Memorial of Her Majesty's Jubilee."

A letter from Mr. J. S. Corregan, Whitemouth, Manitoba, dated 31st August, addressed to the Minister of Agriculture, but which was delivered to, and opened by, the Secretary, was read, asking for information as to the resources of the colony, cost of passage &c., on behalf of some persons desirous of emigrating to Guiana. Ordered that the letter be referred to the Agricultural Committee.

Extracts from Mr. Walker's letters of 7th and 20th September, referring to the Venezuela Boundary question were read. After referring to Mr. Hugh Watts's intended visit to the West Indies to make himself personally acquainted with their position and requirements, Mr Walker writes :—

As this gentleman is taking an active and practical interest in the question of the Boundary between British Guiana and Venezuela, I hope he may be induced to include British Guiana in his travels.

I take the opportunity to suggest that the Royal Agricultural and Commercial Society might materially assist his endeavours to keep this question under the consideration of H. M. Government, by taking action in their corporate capacity in support of the agitation now on foot in this country. It is long since I hinted at the feasibility and desirability of the Society undertaking the functions of a local Chamber of Commerce, in which case such a subject would legitimately and naturally have come within the scope of their deliberations (September 7th.)

You will doubtless notice that Mr. Darnell Davis is a contributor in the columns of the *Colonies and India* to the literature of the Venezuelan boundary question, and I am enabled to say that a further

paper will probably appear in the number for next Friday, the day after the departure of the next Mail Steamer. These papers seem to me to be very important as elucidating and sustaining the British claims, and I think that Mr. Davis is entitled to cordial acknowledgment for the services thus rendered during his relief from official duties.

I trust that H. M. Government will be firm in adhering to the ground they have occupied. (September 20th.)

The Chairman ruled that the Society's Ordinance of incorporation precluded the discussion of all such political matters.

Mr. Hill expressed an opinion that the prohibition referred to contemplated only the exclusion of local politics.

The Honorary Secretary, Mr. L. M. Hill, presented the Society with portrait engravings of two old Demerara celebrities—His Honour Chief Justice Bent, and the Hon. Peter Rose. Mr. Hill thought it would be very desirable to extend our portrait gallery of old Colonists, whenever opportunity offered at sales or otherwise, if members would be good enough to secure such portraits for the Society when they had the chance.

The thanks of the Society were accorded to Mr. Hill for his presentation.

The meeting then terminated.

Meeting held on the 17th November.—Mr. Justice Kirke, M.A., B.C.L., President, in the chair.

There were 20 members present.

Election.—*Associate*: Thos. Garnett.

The President stated that there was no special report from the Directors, but he begged to remind members that the next monthly meeting would be the Anniversary

meeting for the election of office-bearers for the ensuing year, and he hoped to see a large attendance.

The Secretary read a report from the Agricultural Committtee referring to the steps taken for carrying out the intentions of the Society in regard to the appropriation of the sum of $2,000 placed at the disposal of the Agricultural Committee for the experimental growth of economic plants and more particularly the cultivation of fibre-producing plants. The report also gave the results of an experimental shipment of limes to the United States, kindly presented by the Hon. B. Howell Jones, which showed a loss of $18 90, on 10 brls. each containing 1,200 limes which were sold in New York for $5.

The President explained that he had, as Chairman of the Botanic Gardens Directorate, addressed a communication to the Government applying for 50 acres of land on the Demerara River, 25 or 30 miles from town, for the formation of an experimental nursery for the cultivation of economic plants which were found not to thrive well at the Gardens in town owing to their proximity to the strong sea breezes; and he was happy to say he had just received a favourable reply from the Government on the subject.

Mr. Nind deprecated the establishment of nursery gardens so far from town, and thought the object should be to benefit land-owners on the coast land by showing what could be profitably cultivated within the range of the adverse sea breezes referred to. He criticised the want of enterprise in the Botanic Gardens in the cultivation of the minor industries, more especially that of the fibres, instancing the plant *Pandanus odoratissimus*

which in Mauritius proved most useful for the manufacture of mats and sugar bags.

The report was taken for notification, and the Agricultural Committee thanked for supplying it.

Mr. Thos. Watt withdrew his motion in reference to the opening of the Reading-Rooms at night, in consequence of some misunderstanding in regard to its wording.

Rev. John Foreman moved in accordance with notice, that the Agricultural Committee and the Book Committee meet on alternate months after the close of the general meetings. His object was to place a certain amount of responsibility upon the Agricultural Committee, which ought to be one of the most important Committees of the Society, to hold regular meetings for the consideration of matters appertaining to it.

Mr. Drysdale seconded the motion believing that the usefulness of the Agricultural Committee would be materially increased by having a regular meeting day, instead of meeting hap-hazard as at present.

Mr. Garnett, Mr. Nind and the President expressed views opposed to the spirit of the motion, on the ground, that the Agricultural Committee having a Chairman and Secretary of its own should be treated as an independent Committee and be left unfettered as to its meetings without the hard and fast rule suggested.

Mr. Foreman being satisfied with the ventilation which his motion induced, withdrew it with the consent of the President and the seconder.

Rev. John Foreman moved his resolution in reference to the contribution from the funds of the Society of a sum of $100, in aid of the permanent memorial fund for the erection of a statue of Her Majesty the Queen in the

City of Georgetown. The Jubilee year of her reign having arrived, he thought the Society should mark in the manner suggested, its appreciation of the honor conferred upon it by Her Majesty in consenting to be the Patroness of the Society since its re-establishment in 1844.

Mr. Mewburn Garnett seconded the motion.

Mr. F. A. R. Winter moved as an amendment the motion of which he had given notice, that the amount of the contribution be $240.

The Secretary questioned the propriety of such an amendment, considering that it should be dealt with as a substantive motion, it having been notified as such. The objection however was over-ruled.

Mr. Nind opposed on principle both motions, as he believed that the appropriation of the funds of the Society for the object proposed was contrary to the rules of the Society, which clearly specified the objects to which the Society's funds could be devoted, and statues to the Queen were certainly not included. Personally he regretted thus throwing a wet blanket on the loyalty of the Society as he was not deficient himself in that quality, but he maintained that the motions were out of order.

Mr. Colbeck seconded Mr. Winter's amendment, and referred to the appropriation of the Society's funds for the purpose of the Campbell memorial bust as a precedent for the contribution in the present instance.

The President thought that the laws and rules should be read in a broad and liberal sense, and he therefore ruled that the motions were in order. With regard to the remarks made by Mr. Colbeck, in reference

to the Campbell memorial bust, it should be understood that the Society simply replaced the private subscriptions of members which had been placed in its hands, and which unfortunately got lost owing to the bankruptcy of the Society's agent in London to whom the money had been remitted, and the Society was therefore morally responsible.

The amendment was put to the meeting and lost, the original motion was then submitted and carried.

Mr. Nind requested that his protest against the motion be recorded on the minutes.

The Secretary was directed to communicate without delay to the General Jubilee Committee the resolution of the meeting, as the Committee was to meet next day.

Mr. Thos. Watt gave notice of the following motion:—

"That henceforth the Librarian be requested to lay over at each general meeting of the Society a detailed statement showing the total issue of books from the Library during the month previous, distinguishing the respective classes of literature such as fiction, history, biography &c."

A letter from Mr. E. L. Max was read, forwarding for the information of members a sample of *Saccharine*, the new sweetening substance manufactured from Coal-tar.

The thanks of the Society were accorded to Mr. Max for his interesting contribution.

A letter from Mr. J. B. Lewis of Enfield Village, Berbice River, was read, forwarding a sample of Cocoa and referring to the cultivation of the minor industries.

The letter was referred to the Agricultural Committee. In regard to the sample of Cocoa several members pronounced it as being of most inferior quality and badly cured.

Extracts were read from Mr. Walker's letters of 5th and 19th October, referring to the Venezuelan boundary

question, and Ridgway's bankruptcy, and enclosing statement of the Society's funds in his hands. Ordered to be taken for notification.

A letter was read from the Government Secretary, dated 25th October, forwarding a request from the Royal Scottish Geographical Society to be supplied with official documents in regard to the colony for publication in the monthly magazine of the Society.

It was ordered that the Society be placed on the *Timehri* free list, in exchange for its monthly magazine, and it was suggested that the Government might forward a copy of the colonial blue-book.

A notification received from the Smithsonian Institution of the death of Dr. Spencer Fullerton Baird, late Secretary of the Institution and Director of the U.S. National Museum, was ordered to be acknowledged, and the condolences of the Society communicated.

The following presentations were acknowledged with thanks: from Mr. G. H. Hawtayne, C.M.G., 3 parts of the "Forest Flora of South Australia", with illustrative plates; from Mr. Stewart Culin, 929, Clinton St., Philadelphia, "China in America," Chinese social life in the Eastern States.

Mr. J. J. Quelch, the Curator, exhibited the following recent additions to the Museum, and gave explanatory remarks on them;—

1. A specimen of the Gecko or wood-slave *(Platydactylus rapicauda)*, from Georgetown, presented by Mr. F. White.

2. Young specimens of Labarrias, born in the Museum.

3. A Chalcis Lizard *(Chalcis flavescens)* shewing a nearly serpentiform body with four minute limbs; from the Puruni, presented by Mr. C. A. Lloyd.

4. The tail of the Labarria, shewing the horny spine attached to the tail—similar to that in the bushmaster.

5. Various forms of rare *Orthoptera*, such as walking sticks and leaf-insects from the Demerara River, presented by Mrs. Jenman.

6. Various forms of rare *Hemiptera* from the Demerara River, such as the rare lantern-flies *(Fulgora lanternaria)* presented with other insects by Mr. Commissary Swain; and the wax-insects, presented by Mrs. Jenman.

7. Various forms of rare *Lepidoptera* from the Demerara River, presented by Mrs. Jenman.

The Curator also reported the preparation of a large Saw-Fish *(Pristis)* more than 12 feet in length, and a large Water-Camoodie, nearly 17 feet in length, and the mounting of the skeleton of a Yellow-tail Snake, for the Museum.

The meeting then terminated.

REPORT OF THE AGRICULTURAL COMMITTEE.

Report of the Agricultural Committee of the Royal Agricultural and Commercial Society, on the vote of two thousand dollars made to the Committee at a general meeting of the Society in February last, for the purpose of encouraging agriculture and experimenting on the growth of fibres as an article of export in the future.

With the view of carrying out the wishes of the members of the Society in regard to the growth of fibres, Mr. Jenman was communicated with, to ask for an interview for the Chairman and Secretarv of the Committee to arrange how the experiment could be carried out, the President of the Society having stated that Mr. Jenman would be glad to make such experiments in the Botanical Gardens; but on the 4th March, 1887, a letter was received from Mr. Jenman saying: "Before I can take any steps I must know from the Society the condition on which the grant is made." This letter was referred to the next general meeting, but nothing more was done about growing fibre in the Botanical Gardens; but nothing discomfited at the rebuff of the Government Botanist, enquiries about the growing of fibres as an article of export have been kept on foot and from all the information gained the Committee have come to the conclusion that it would not pay as a first

product, but if the cultivation of bananas was established the fibre of the stalk might possibly be utilised as an offal crop.

While prosecuting enquiries as to the growth of fibres, the second object of the Society—the encouraging of agriculture—has not been lost sight of, and the members of the Committee being of opinion that the kind of agriculture that should be encouraged was such as would induce the small land-owners of the country to take part in it, sent out circulars to the clergymen in the rural districts and managers of sugar estates, enquiring if a sufficient quantity of bananas could be grown in the colony to establish a trade with the United States of America. The replies have been most satisfactory, but before commencing to cultivate them it is necessary that some tangible proof of their intention of carrying on such a trade should be given by the fruiterers of America, by making small advances to the farmers to warrant their putting their lands into banana cultivation ; or better still, if some American firm would purchase land in the colony and cultivate bananas as the nucleus of its trade. But if the undertaking is to be solely dependent on some ship-owner sending a vessel occasionally as a speculation, then better not attempt the growing of bananas at all, as it must inevitably end in loss and disappointment.

While making enquiries about the banana trade, the committee thought it advisable to make a practical test of shipping to New York 10 barrels of limes kindly given to the Society by Mr. Jones of Pln. *Hope* and they regret to state that the experiment has proved most unsatisfactory. The limes were shipped per s. s. *Barracouta* and consigned to Messrs. Leacroft and Co. of New York and sold for $5, and the charges were $4 95, leaving a balance in favour of the Society of 5c. but against this are the following charges in the colony :—

Cost of collection and packing including barrels	...$7
Paper for wrapping in...	... 2 88
Carriage by rail...	... 1 25
Freight to America	... 7 50
Cartage to La Penitence	... 32

So that practically the Society has lost $18 90 in the transaction.

The Committee endeavoured to obtain from the Government a part of the Botanical Gardens for the growth of economic plants without success, and felt that without some such arrangement it is impossible to carry out the wishes of the Society ; and are of opinion that work of such a nature should be undertaken by the authorities of the Botanical

Gardens which was established for the acclimatization of plants and to assist the agricultural interests generally throughout the colony.

Failing to obtain a portion of the Botanical Gardens, the Committee had been offered a piece of land on Plantation *Houston*, by Mr. Jones, but on inquiry it was found not to be suitable for the purpose intended.

Extracts of letters from Mr. Walker :—

Although Parliament is in recess you will observe from the pages of the *Colonies and India* that there is no cessation of the efforts to throw light upon the question of the boundary between British Guiana and Venezuela, and I feel constrained to express the hope that the local Government or the Royal Agricultural and Commercial Society, or both, may be disposed to take an active interest in the question by providing funds to meet the cost of making needful researches in the British Museum, the Record Office and similar collections, with the object of establishing our rights in the disputed territory.

The matter is rapidly becoming one of increased interest and importance and should not be allowed to go to sleep again in its present condition of incertitude; and this reminds me that years ago it was suggested that the library of the Society should gradually be made to comprise a *complete* collection of *all* available works relating to the Western Hemisphere, including maps, charts and manuscripts, the nucleus of which may be found in the Department of Local Literature indicated in each of our recent catalogues.—(Oct. 5.)

So far as one can judge from the newspaper reports, the success of the local efforts for the Jubilee celebration must have been complete and afforded unalloyed gratification.

Since the date of my latest letter I have received from Messrs. Champion & Sons, Solicitors, their bill of costs for services rendered to the Society in the matter of Ridgway's Bankruptcy, amounting to £21 3s. An inspection of this account will show that I have only sought Messrs. Champion's intervention upon technical matters and where it was indispensably necessary. I have myself carried on all the other correspondence with the officials and others concerned, and when I found, as reported in my letter of the 26th January, that there was no prospect of a dividend becoming payable, I requested Messrs. Champion & Sons to favour me with their bill of costs under the impression that their pro-

fessional services were not likely to be again required. Some considerable time elapsed before they gave effect to this request, and as the matter is somewhat exceptional in its character, I should very much wish to obtain the sanction of my brother Directors before making payment of the amount. I enclose a memorandum of the state of the Society's funds in my hands to date, from which it will appear that I am quite in a position to pay this claim and to provide for all ordinary expenditure on this side on account of the Society, during the earlier months of 1888, and this I trust will be found satisfactory.

I have recently again applied to Mr. Hurlbatt, the Official Trustee, as to the prospect of a dividend, and his reply is that the difficulties to which he alluded in his letter of January 24th, as precluding the immediate declaration of a dividend still exist, but that some progress has been made towards affecting a settlement, and he hopes it will not now be long before a dividend can be announced. This is after all, but somewhat of cold comfort, but it leaves room for hope that the Society may be at least recouped the amount of the lawyer's bill.

I venture to express the hope that the importance of the boundary question is not being lost sight of by the local authorities,—(Oct. 19th.)

Meeting held on 15th December.—Mr. Justice Kirke, M.A., B.C.L., President, in the chair.

There were 18 members present.

Election.—*Member :* Alex. Gordon, S.J.P.

A letter was read from Mr. J. C. R. Hill, Honorary Secretary to the Jubilee General Committee, conveying the thanks of the Committee for the Society's contribution towards the permanent Memorial Fund.

The President reported that the Directors had recently under consideration the matter of the Secretaryship of the Society. Unfortunately Mr. Hill the present

Honorary Secretary had found it necessary to intimate to the Directors that in consequence of press of other work connected with his public duties, it would be impossible for him to continue to hold the office with any degree of credit to himself or justice to the Society. The Directors having failed to find a gentleman with sufficient spare time to undertake the duties of Honorary Secretary, had determined to obtain the services of a paid Secretary, who, being a thoroughly competent person, could also undertake the duties of Librarian. Believing that Mr. Crumpton the present Librarian was, from bad health, physically incapable of undertaking the duties of the dual office, the Directors suggested to him the advisability of resigning, which he accordingly did; and the Directors now asked the Society to sanction the payment to Mr. Crumpton of $500 by way of gratuity for his long service. They had since advertised in the local papers, for a Secretary and Librarian, and hoped to make a suitable appointment before the close of the year.

Mr. Daly moved that the action of the Directors be approved of and the payment of $500 gratuity to Mr. Crumpton sanctioned.

The Rev. John Foreman seconded the motion which was carried.

Mr. Darnell Davis pointed out the difficulty under existing bylaws of appointing a paid Secretary. In the bylaws, provision was made for the annual election of a Secretary who must be a member of the Society, and who by virtue of his office is a member of the Directorate and of all Committees. He suggested that the difficulty might be got over by appointing an Hon-

orary Secretary who would be only nominally Secretary, merely supervising a paid competent Assistant Secretary who would practically do all the routine work of the office.

In reply to the President, Mr. Hill said that under such conditions as these with practically no work to do, he would be willing to continue in office if the members were good enough to desire it.

Mr. Winter suggested that the time for receiving applications for the new office should be extended, so as to permit of persons in the Islands or in England applying.

The President said that of course, if they were not able to secure the services of a suitable person in the colony, it would then be necessary to extend the field of operations and seek applications outside the colony.

A report was read from the Agricultural Committee in reference to the establishment of an experimental garden for the cultivation of economic plants, suggesting that instead of acquiring a piece of land up the Demerara River, for the purpose, the Government should be asked to allow a series of experiments to be carried out at the Penal Settlement, where convict labour would be available ; and also suggesting that before extending operations elsewhere, the Government should be urged to more efficiently drain the Botanic Gardens.

A letter was read from the Secretary to the Committtee of Correspondence, conveying the thanks of Mr. Durden of the State Mining Bureau, California, for the specimens of woods forwarded to him. Ordered to be taken for notification.

The election of office-bearers for the ensuing year was then proceeded with. On the motion of the President,

seconded by the Hon. B. Howell Jones, Mr. P. H. Nind was unanimously elected President for 1888; and Mr. G. H. Hawtayne, C.M.G., as Vice-President, on the motion of Mr. Kirke, seconded by Mr. Garnett.

The nomination of a Vice-Patron was allowed to stand over until the arrival of the newly appointed Governor, Viscount Gormanston, when a deputation of the Directors, would wait on him, and ask his acceptance of the position.

The only change made in the Directorate was the election of Mr. N. Darnell Davis to the seat rendered vacant by the appointment of Mr. Hawtayne as Vice-President. Messrs. Conyers and L. M. Hill were re-elected Hon. Treasurer, and Hon. Secretary, respectively.

On the Agricultural Committee, the Hon. W. A. Wolseley was substituted for Mr. Rashleigh Porter, and the Hon. Thos. Mulligan for Mr. John Minty, resigned.

On the Committee of Correspondence, the following changes were made :—Mr. N. Darnell Davis, in place of Mr. Fresson, and Mr. Henry Kirke, in place of Mr. Hill, both deceased.

On the Book Committee, the following changes were made :—Mr. B. S. Bayley, Dr. Finlayson and Mr. Jas. Thomson, were struck off for non-attendance; and the Revds. T. J. Moulder and W. Lavender, appointed as new members.

Mr. William Walker was unanimously re-elected as Resident Director in London, and on the motion of the President seconded by Mr. Hawtayne, a hearty vote of thanks was accorded to him for the continued attention paid by him to the interests of the Society at home.

In the absence of Mr. Thos. Watt, and at his own request, the motion standing in his name, in reference to the monthly returns of books issued from the Library, was allowed to stand over.

The Revd. John Foreman gave notice of the following motion:

That acting on Rule 2, Chap. viii, *Funds*, the Directors of the Royal Agricultural and Commercial Society be requested, out of the surplus funds of the Society for the year ending 31st December 1887, to add as much as they possibly can to the $2,000 already placed at the disposal of the Agricultural Committee of the Society for agricultural purposes.

The President read a communication received from Mr. John Minty, containing the results of the planting of the several samples of Rice forwarded to Mr. Russell from Calcutta by Mr. Robt. Mitchell.

On the motion of the President, seconded by Mr. Hawtayne, the Secretary was directed to convey the thanks of the Society to Mr. Russell and to Mr. Minty for the care and trouble taken by them in the matter. It was decided to exhibit in the Exchange Rooms* the samples of rice forwarded by Mr. Minty, and to refer the report to the Agricultural Committee.

A letter was read from Major Chapman of Chelsea, England, in reference to the possibility of establishing a company for the development of the fruit trade, growing of rice etc. and expressing his readiness to take shares in such a company.

The Secretary was directed to acknowledge receipt of the letter, and to inform Major Chapman that the formation of such a company was not contemplated at present.

* These samples will eventually be placed in the Museum.—ED.

The following Extract of a letter from Mr. William Walker, dated 16th November 1887, was read, referring to the Venezuelan boundary question; and was ordered to be taken for notification:—

I must own to being somewhat disappointed at the vetoing of the question as to the Venezuelan Boundary because it is manifestly desirable that the colony should display an active interest in the discussion of a matter so important to its future, and there is no body, with the exception of the local legislature, so fully representing the general community, as the Royal Agricultural and Commercial Society; action on the part of the Mayor and Town Council of Georgetown is unquestionably important, but that body represents only a limited area.

I am, however, bound to admit that the chairman was abundantly justified in his ruling by the words of the Act of Incorporation which are explicit against the discussions of all questions of a political nature or tendency. Doubtless the effect of this declaration, as fettering the expression of the Society's views upon subjects largely affecting the economic position of the colony, could not have been foreseen at the time and is in itself unfortunate. If, however, there were in existence a Chamber of Commerce, such a topic would seem to come legitimately within its scope, and I have more than once indicated the opinion that to avoid multiplying organisations having kindred objects in view, the Royal Agricultural and Commercial Society might well assume such functions with benefit to the colony. I may add that when framing the rules of the Royal Colonial Institute we experienced a similar difficulty, and it was surmounted by the adoption of the formula, "But no paper shall be read, nor any discussion permitted to take place, "tending to give to the Institute a party character." It is obvious that many questious of policy may occur affecting the vital interest of the community which can be discussed without reference to the fact of a particular political party being possessed of the administration of the Government. In my individual opinion, if I may venture to express it, the Boundary question is one upon which the Institute could quite legitimately express an opinion were it desirable to do so, but as H. M. Government have avowed their disposition to protect the interest of the colony it only remains, as it seems to me, for the colony itself to adopt such active steps as may indicate its determination to support its claim to the disputed territory.

I believe I may add that the valuable contributions of Mr. Darnell Davis to the literature of this controversy, which have appeared in the columns of the "Colonies and India" will be shortly republished in a collected, and therefore more convenient form.

A letter was read from the Government Secretary, dated 29th November, No. 7,864, enclosing minute from the Government Botanist, on the subject of a supply of properly arranged specimens of colony woods. The Government Botanist asked for more definite information as to the probable cost, sizes and number of sets of specimens required by the Society; and although expressing his belief that a collection of complete sets of specimens with all the information suggested, would serve a useful purpose, he pointed out the great difficulty and delay involved in getting the desired information.

Mr. Hawtayne mentioned that the coloured lithographed plates in the number of the *Forest Flora of South Australia*, presented by him at a previous meeting, gave a capital idea of what was required in regard to our own colony woods, and fairly represented what was exhibited at the Forestry and Indio-Colonial Exhibitions. He admitted that the collection of such complete sets of specimens would take considerable time and trouble, but it might be done gradually, from time to time, as opportunity offered.

The matter was ordered to be brought up again at the next meeting.

A letter was read from the Government Secretary, dated 7th December, 1887, No. 8,349, enclosing a request from Messrs. Rimmer & Co. of Liverpool, asking for information as to the port of Georgetown, for insertion in their Shipping Directory. Ordered to be referred to the Committee of Correspondence.

A circular was read from the Secretary of the London Chamber of Commerce, in reference to the "Merchandise Act of 1887," suggesting the advisability of local legislation to give effect to the same within the colony. Referred to the Exchange-Room Directors, to take any action they might consider necessary in the matter.

The thanks of the meeting were accorded to Major Bunker, United States Consul, for a report of the Statistical Department of the State of Indiana, for 1886: also to Mr. H. S. Durden, the Secretary of the State Mining Bureau, California, for copies of the 5th and 6th Annual Reports of the State Mineralogist of California.

The meeting then terminated.

REPORT OF THE AGRICULTURAL COMMITTEE.

Report of the Agricultural Committee of the Royal Agricultural and Commercial Society, to the Society, on the project of the Government to acquire lands, on one of the Banks of the Demerara River for the growth of economic plants.

The remarks of the President of the Society at a meeting held on the 17th November, 1887, that the Government intended acquiring 50 acres of land on the Demerara River, for the purpose of growing such Plants as would not grow at the Botanical Gardens, and that a portion would be given to the Royal Agricultural and Commercial Society for the purpose of enabling the Agricultural Committee of the Society to experiment in the growth of economic plants, were considered at a meeting held on the 5th December, 1887; and the Committee agreed to urge on the Society the advisability of recommending to the Government the necessity of having the Gardens thoroughly drained before extending their operations elsewhere, as they are of opinion that a great many things can be grown in the Gardens, which would in course of time form the nucleus of an important export trade from the colony, as was originally intended when the Gardens were first started, and in

the event of its being necessary to make experiments for the growing of Plants that will not seed in the Botanical Gardens that it should be done at the Penal Settlement by convict labour under a competent gardener.

DESCRIPTIVE LIST FORWARDED WITH THE RICE SAMPLES BY MR. MINTY.

A. *Banafool.*—A short round strong straw-coloured seed. Sample reaped—a long thin straw-coloured rice. Crop, a failure, only a few seeds springing. Sample reaped not identical with seed sown.

B. *Oush.*—Seed sample destroyed. Sample reaped, a light brown chocolate-coloured rice, round and long—regular crop.

C. *Kalandy.*—Seed sample—a pale bluish straw full sized rice. Sample reaped, identical with seed—a regular but only fairly close crop. Strong straw.

D. *Shaban.*—Seed sample—short and well filled, a rich straw colour, similar to Banafool. Sample reaped, a bluish straw coloured rice, longer and thinner than the seed sample. Crop, a complete failure, sample seeds apparently good—produce not identical with sample.

E. *Dholey*—Sample seed—a fine rich light straw-coloured one. Sample reaped, a dull greyish straw-coloured rice, crop poor.

F. *Nonaboldar*—Sample seed—a dirty dark coloured short seed—received in bad order. Sample reaped, similar to seed but slightly lighter in colour. Crop almost a failure.

G. *Lalljota.*—Seed a light bluish straw colour. Sample reaped almost identical but straw colour not quite so pronounced, heavy crop.

H. *Jota Kolmy.*—Seed, a medium sized light brown colour. Sample reaped similar to seed but slightly darker in colour. A fair crop but a little thin on ground. Straw very big and strong.

I. *Surgee Monee.*—Seed, a light brown straw-coloured small sized one. Sample reaped, a long seed, light chocolate red colour, looks very like Oush. Crop, a failure, only a few tufts having grown.

J. *Cholmowel.*—Seed, a very light brown coloured long one. Sample reaped identical—a heavy crop, fell over badly, heavy head and strong straw.

K. *Goiabally.*—Seed, a handsome very light straw colour—medium sized rice. Sample reaped, a light straw colour, medium size rice, straw colour not so bright as seed. A fair crop but irregular.

L. *Khoyar.*—Seed, very dark straw-coloured sort—crop, a failure—no sample.

M. *Hoorangooly.*—Seed, a light brown, small sized rice. Sample reaped, almost identical in colour, but rice slightly longer. A good, regular close crop, strong straw.

N. *Hamtaroghee.*—Seed, a full sized rice, light bluish straw. Sample reaped identical, a fair but irregular crop, very big and strong straw, heavy heads.

O. *Thulhaychalmowel.*—A dark rotten looking seed in bad order, no sample—crop a failure.

P. *Nonacholma*—Seed, a full sized rough rice, straw colour. Sample reaped, almost identical. A good regular standing crop, strong straw.

Q. *Chamormowee.*—Seed, a short well filled rice, brown colour. Sample reaped a rather long, indifferently filled rice. Poor crop.

R. *Pachabhog.*—Seed, a well filled and full sized one, light straw colour. Sample reaped, identical, straw colour not quite so bright, earliest rice of all, crop very good, ear heavy, straw small.

S. *Lallhamctaroghee.*—Seed, a poorly filled dark brown coloured one. Sample reaped, identical. Crop good. Very heavy crop of strong coarse straw, late in heading and ripening.

T. *Motobackooi.*—Seed, a light straw-coloured rice. Sample reaped, almost identical, but grain bigger and fuller. A fair crop.

Oush, *Cholmowel*, and *Lallhamctaroghee*, rices of dark brown colour, are preferred by most of the coolies.

Election of Office Bearers for 1888.—The following were elected :—

Patroness:

THE QUEEN.

President :

P. H. NIND.

Vice-President :

G. H. HAWTAYNE, C.M.G.

Managing Directors :

D. C. CAMERON
M. GARNETT
J. S. HILL.

Ordinary Directors :

S. M. BELLAIRS
N. D. DAVIS
R. P. DRYSDALE
ALEX. DUNCAN
B. HOWELL JONES
R. J. KELLY.

Exchange Room Directors :

JOHN J. DARE
THOS. H. GLENNIE
ARTHUR WEBER.

Honorary Treasurer :

F. A. CONYERS.

Honorary Secretary :

LUKE M. HILL.

Agricultural Committee:

R. J. KELLY, *Chairman.*
A. BARR, *Vice-Chairman.*
D. C. CAMERON, *Hon. Secretary.*

HON. C. L. BASCOM
S. M. BELLAIRS
A. BRAUD
B. R. CLARKE
HON. WM. CRAIGEN
R. P. DRYSDALE
J. M. FLEMING
MEWBURN GARNETT
A. R. GILZEAN
E. C. LUARD
HON. T. M. MULLIGAN
JOS. MONKHOUSE

ERRATA.

On p. 215, lines 9 and 12, and p. 237, line 7, for "flint-implements" read, "stone-implements".

On p. 223, line 25, leave out, "and duckling".

On p. 242, line 23, for "every" read "nearly every."